A macro-financial assessment of the UN Global Policy Model

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I have been asked to undertake a review of the UN Global Policy Model (GPM) with the purpose of assessing how appropriate it is for the analysis of economic policy scenarios and its usefulness to derive relevant policy recommendations. Given my field of expertise, my review will be conducted from a macroeconomic perspective that will mainly focus on the interactions between real and financial variables. This will thus be essentially a 'macro-financial' assessment. The assessment is principally based on the technical description of the model provided by Cripps and Izurieta (2014), but I have also consulted some additional documents related to the model, such as the paper by Capaldo (2014), as well as the relevant parts of the UNCTAD Trade and Development reports of 2013 and 2014.

Preliminary remarks: accounting consistency

A short description of the UNCTAD Global Policy Model can be found in the 2014 UNCTAD report: 'The GPM is a fully endogenous modelling framework based on water-tight accounting without "black-holes" and without unexplained residuals, as true values are adjusted by add-ons. Behavioural relations that determine the macroeconomic adjustments are estimated econometrically using panel (124 countries) and time series (period 1980 to 2012). The model covers 25 countries and country groups, and considers GDP in main sectors; public, private and financial institutions; employment; international trade (five main categories) and finance; and fiscal, monetary and industrial/trade policy' (p. 38).

Through this compact description, it is obvious that the GPM is a remarkable achievement. There are few models out there that cover the whole world; there are few that are estimated econometrically rather than being dependent upon calibration; and while all computable general equilibrium (CGE) models also claim that they have water-tight accounting, very few of them do so by taking into account the evolution of financial flows and a fortiori financial stocks.

Although the GPM is an econometric model, which is estimated, it is not a forecasting tool in the usual sense. This is because there is a relatively large number of variables which are taken as exogenous. The advantage of such a procedure however is that add-on parameters allow the authors of the model to examine the implications of policy changes, precisely through changes in these exogenous variables.

Although an econometric model, because of its full accounting consistency I take the GPM to be a kind of CGE model, but a CGE model which is not in the neoclassical tradition that has come to dominate economics. As recalled by Sherman Robinson (1991; 2006), CGE models have arisen in two strands. The first strand is the one that got most developed at the World Bank, based on neoclassical microeconomic theory and neoclassical trade theory, relying essentially on price and substitution effects, where most of the effects are driven by changes in relative prices. It is sometimes claimed to have strong roots in Walrasian general equilibrium theory of the Arrow-Debreu type, giving it an aura of respectability, with agents maximizing utility functions (that cannot be observed) and producers that maximize profits and face neoclassical production functions (the elasticity estimates of which have been shown to be 'not even wrong' by Felipe and McCombie (2012)). The second strand is essentially based on Keynesian foundations, meaning here that full employment is assumed away and that aggregate demand and income multiplier effects play a key role. It is sometimes referred to as the structuralist CGE strand. This second strand was developed most intensively by Lance Taylor (1990), and its intellectual roots are mainly informed by the work of non-neoclassical economists, such as Nicholas Kaldor and Michal Kalecki.

Despite their different intellectual pedigree, both of these strands in their initial versions were focused on real effects and worked within a flow-equilibrium framework, thus ignoring financial flows and stocks of financial assets. Attempts to remedy this were made by representatives of both strands in the early 1990s (e.g., Rosensweig and Taylor 1990; Bourguignon et al. 1991), and both Robinson (1991) and Asada et al. (2011, p. 60) seem to believe that neoclassical financial computable general equilibrium (FCGE) models entertain a number of common features with structuralist CGE models, although it is recognized that the neoclassical FCGE models face several strains and theoretical tensions as the some of their

innovations appear like *ad hoc* additions that are seen to be incompatible with 'fully-rational' microeconomic foundations. Indeed, as recalled by Dirk Bezemer (2010, p. 682) in a paper that pertained to explain why few economists had been able to forecast and provide reasons for the Global Financial Crisis, the financial sectors of CGE or large forecasting models were progressively left aside to the benefit of real-variable DSGE models.

The GPM, in my understanding, is akin to an FCGE model, but one that shares its intellectual pedigree and many of its assumptions with that of the structural CGE models, which are based on alternative microeconomic foundations that reject optimizing assumptions. There is a debate as to whether or not this is legitimate, and two views clearly emerge: there are those who argue that optimizing models are the only way to go, with deep parameters being embedded in the utility functions of representative agents, thus responding to the so-called Lucas critique; and there are those who argue that optimizing models are themselves *ad hoc* constructions, since they assume from agents a behaviour and knowledge which are totally unrealistic and which cannot at all be observed in real life. This latter strand of thinking is particularly fashionable now among the creators of agent-based modelling, with its interaction of a multitude of agents, who know neither the true functioning of the whole economy nor the characteristics of other agents, in a world which is in perpetual motion and dominated by epistemic and ontological uncertainty.

CGE models and the GPM share consistent accounting through the use of social accounting matrices (SAM). They both rely on data, or massaged data, that insures that income equals expenditure, through the national income and product accounts, so that everything that flows in must also flow out. They both rely on the incorporation and proper summation of the *fundamental identity*, which says that in each country domestic private net lending plus domestic public net lending and foreign net lending must sum to zero. Devoid of the lingo of the national accounts, this says that the sum of private saving net of investment, the government budget surplus and the current account deficit must be equal to zero.[1] This identity was at the origin of the so-called New Cambridge model, developed at the Department of

[1] Pure CGE models omit interest payments on foreign assets and refer to the trade balance instead.

Applied Economics (DEA) of the University of Cambridge, as can be described in some detail by Godley and Cripps (1976) and in stylistic form by Godley and Cripps (1983). This New Cambridge model is the remote ancestor of the GPM, as it also got developed in the late 1970s into the model of world trade that was constructed at the time by the Cambridge Economic Policy Group located at the DEA, with the main author of this global modelling work, Francis Cripps, being at the origin of the present GPM. The Cambridge-Alphametrics model (CAM) is also in this tradition (Cripps et al. 2007; Cripps et al. 2011).

The accounting-consistent approach followed in the New Cambridge model, reinforced by the portfolio theory work of Tobin and in particular by its more empirically-oriented version of Backus et al. (1980), has also given rise to what is called the post-Keynesian stock-flow consistent (SFC) approach as presented by Godley (1999) and Godley and Lavoie (2007). This SFC approach has led in particular to the creation of several two, three and even four-country theoretical models that fully integrate real and financial variables, including the evolution of financial stocks (Izurieta 2003; Mazier and Tiou-Tagba Aliti 2010). These SFC models also entertain assumptions which are in line with those of the structuralist CGE models. Indeed, the influence is reciprocal, as the proponents of structuralist CGE models have picked and endorsed the key elements of this SFC approach (Taylor 2004). It is worth adding that the SFC approach has also been adopted by Joseph Stiglitz, and incorporated in particular in a range of agent-based models, developed by some of his collaborators, thus providing consistency where it was not previously always present. They go so far as to argue that agent-based stock-flow consistent macroeconomics should constitute the new paradigm and the new benchmark (see Caiani et al. 2015). The point to be made here is that there is a long-standing intellectual tradition tied to the framework and background of the GPM, and that this intellectual tradition is still very much alive and active today despite the dominance of the neoclassical school and that of the CGE and DSGE models.

As Taylor (2011, p. 4) points out, ‘consistent macro accounting limits the degree of freedom available to a CGE model’. Of course, all proper models incorporate the stock-flow consistency that is inherent in the relationship between real investment and the tangible stock of capital. The post-Keynesian SFC models and the GPM extend this consistency to sets of

financial flows and to stocks of financial assets and liabilities. The GPM relies on data that insures that every financial asset finds its counterpart liability. This is done by relying on flow-of-funds matrices as well as national balance sheet accounts (financial accounting matrices), along with revaluation matrices which take into account holding gains and losses. These consistency requirements, combined to the standard requirement that links flows of real net investment to additions to tangible capital stocks, allow the builders of the GPM to make the claim, as recalled earlier, that the 'GPM is a fully endogenous modelling framework based on water-tight accounting without black holes'. In other words, everything comes from somewhere and goes somewhere. All this makes for the *full* integration of the real and the financial sides of the economy – what I consider to be the *Holy Grail* of macroeconomics, as the use of logically complete accounts has strong implications for the dynamics of the system as a whole, both at the national level and at the world level.

It should be pointed out however that two apparently similar models with accounting consistency will nonetheless give rise to different conclusions depending on their specific *behavioural* equations and depending on the *closure* of the model. Models with the same structure but with dissimilar behavioural equations will give rise to different results. Similarly, while two models may contain exactly the same sectors, the same variables and the same behavioural equations, their conclusions will be different depending on what variables are assumed to be endogenous and which ones are assumed to be exogenous. This turns out to be the true point of contention between supporters of neoclassical CGE models and what has been called structuralist CGE models, as we shall see later. In my opinion, it is all a matter of judging which assumptions, and hence which closure, appears to be the most realistic and reasonable. Indeed, even within a given model, say a structural CGE model, several closures may be possible. For instance, if a country is assumed to be running on a fixed-exchange rate regime, this may be achieved in different ways: foreign exchange reserves may be endogenous, while its government expenditure and interest rates are exogenous; but we may also assume that foreign exchange reserves and interest rates remain unchanged, while the government modifies its fiscal stance so as to achieve a zero balance-of-payment position. In reality, countries may choose to endorse policies that constitute a mix of these different closures.

Stock-flow consistency

Previous financial crises, such as the Mexican financial crisis of the 1980s, along with the Japanese of the early 1990s and the Asian financial crisis of the late 1990s, have certainly signaled the need to incorporate financial variables in theoretical or empirical models of national economies and of the global economy. While a number of economists, like those of the BIS, did start to pay attention to the evolution of asset prices and to financial or debt ratios, it is only with the advent of the Global Financial Crisis that started in 2007 that central bankers and international organizations truly realized that existing models based essentially on real economic variables lacked relevance. Although there had been a lot of talk about global imbalances, meaning here on the one hand imbalances in the current account positions of countries or block of countries as well as the accumulation of foreign debt or the accumulation of foreign exchange balances and on the other hand the acceleration in the rise of household debt in a number of countries, before the Global Financial Crisis few models were equipped to discuss in a relevant way what had or what could happen. This is recognized in the following speech of the current Governor of the Bank of Canada, Stephen Poloz, the former President of the Canadian Export Development Bank:

> In a perfect world, we would have a macroeconomic model sophisticated enough to capture the emergence and resolution of financial imbalances, along with their related impacts on the real economy. With such a model, we would be able to incorporate financial stability threats into our reaction function, if not with absolute precision, then at least as well as we incorporate other economic variables. Unfortunately, we don't live in that perfect world. A general-equilibrium model containing a grand synthesis of real and financial variables doesn't exist and isn't likely to. (Poloz 2015, p. 2).

My interpretation of Poloz's statement is that he means that there is no such micro-founded neoclassical CGE or DSGE model. But of course, there are other models that 'contain a grand synthesis of real and financial variables', and the GPM is one of them – and one that does it at the world level. I am not claiming that the GPM is able to forecast future financial crises such as the subprime financial crisis or the Global Financial Crisis, but at least the GPM tracks

the evolution of financial assets and liabilities of the non-financial private sector, while simultaneously assuming that demand effects have substantial effects on economic activity, and has been doing so for a long time. This is in contrast to some of the other large models used by other large organizations.

As pointed out by Bezemer (2010) in a couple of papers that have attracted quite a bit of attention, most or at least many of the researchers that did see the Global Financial Crisis coming, and who provided reasons and arguments of why a financial crisis may generate a recession, were relying on an approach or on models that included flows of funds and financial stocks. This was in particular the case of researchers at the Levy Economics Institute, led by Wynne Godley, who issued many warnings, both before the 2001 recession and before the subprime financial debacle. The American and world models used at the Levy Institute, share similar antecedents with the GPM, as the former arose from the earlier work on the New Cambridge model while the latter is based on the world trade model developed by Cripps (1979) at Cambridge. The Levy model of the US economy is also fully stock-flow consistent, and it includes credit flows and wealth to income ratios in its determinants of real private expenditures, as is the case of the GPM in its determination of consumption and private investment spending.[2]

This can be contrasted with most large-scale models. As indicated by Bezemer (2010), while the proponents of large-scale CGE models claim that the equations of their models are properly derived from neoclassical theory, thus providing them with a presumed internally-consistent structure, the values of all real-sector variables are fully determined by real variables only, with the outside addition of a few financial variables such as the stock of money and interest rates. Monetary and financial variables are sometimes included, but these result from the behavior of real variables, for instance the trade balance, thus ignoring the evolution of financial stocks and interest payments on financial debt. Mainly as a follow-up to the Global Financial Crisis, there is presently a good deal of work going on in central banks and in large international organizations to incorporate financial variables. But these efforts to integrate the

[2] See Cripps and Izurieta (2014), equations (1) and (2).

financial side to the real economy, as was the case for FCGE models, generate a great deal of strain and inconsistency when they are applied to DSGE models. DSGE model builders, who long bragged about how rigorous their microeconomic foundations were, are now forced to assume all kinds of what they can only consider as *ad hoc* adjustments and additions in order to overrule the consequences of assuming the strong forms of the efficient market hypothesis, the Miller-Modigliani theorem or the impossibility of defaulting on loans.

One might as well move on to a different modelling strategy, based on a more realistic and proven empirical approach. As many economists dissatisfied with the mainstream approach have said, it is better to be roughly right than precisely wrong! And in my view, this is what the GPM has to offer. The model is not informed by the unrealistic and highly formal neoclassical foundations which are now so popular among CGE and DSGE builders, but it has evolved into a large stock-flow consistent model, supported by a long tradition in Keynesian and structuralist empirical model building. As is explicit in the presentation of the GPM, financial flows and balance sheets do help to determine real variables. The following passage from their presentation is particularly telling.

> In the GPM, finance is not a 'black hole'; the flow-of-funds accounts and balance sheets of the main institutions are explicit and dynamically integrated into the model by accounting rules and behavioural relations. Therefore, changes of income and expenditure of governments, the private sector, and national economies are fully translated into changes of net lending or borrowing positions of these sectors. Such flow 'closures' may directly influence behaviour. In addition, the accumulation of flows on balance sheets of institutions and external assets and liabilities feeds back into the adjustment behaviour of the real economy. Despite the fact that the matrices of flows and of stocks are of a high degree of aggregation, they have proven to be a meaningful factor in model dynamics, particularly when imbalances grow disproportionally, altering historic stock/flow norms….
>
> The relationship between the real economy (trade, production, income, spending etc.) and the financial system (deposits, debt, stocks and other types of financial asset and liability) in the GPM may be summarised as follows:

> (i) real flows are necessarily matched by opposite financial flows and therefore in the short run may be said to constrain the latter on a net basis (so-called financial balances)
>
> (ii) gross flows of financial assets are largely determined by what may be described as 'financial' behaviour, subject to the constraints implied by (i) and recognizing that much financial behaviour has its roots in real economy opportunities and requirements
>
> (iii) gross financial positions (accumulating flows and revaluations) feed back into real behaviour. (Cripps and Izurieta 2014, pp. 5-6).

The advantages of such an approach are now being recognized by a number of actors. Besides the large organizations that try to refurbish their existing models by adding on financial variables, there are actors who take very seriously the stock-flow consistent approach that informs the DGPM. The chief economist at Goldman Sachs, Jan Hatzius (2003), has for some time now adopted the framework advocated by the Levy Economics Institute. Other investment advisors, such as Richard Koo (2013), who has made a name for himself by putting forth the concept of 'balance-sheet deleverage' recession, has also made a systematic use of the fundamental identity. Some researchers at central banks are also keen to construct stock-flow consistent model, or at the very least to examine in more detail financial flows and balance sheets (Bartwell and Burrows 2011; Bê Duc and Le Breton 2009). This allows to tackle questions such as unsustainable processes or financial instability. As Vítor Constâncio (2014, p. xv), vice-president at the European Central Bank, points out, 'the flow of funds at least offers a framework in which asking such questions is possible and meaningful. Such "bottom up" economics would seem to provide a healthy antidote to the self-referential "top-down" modelling that has been prevalent in recent decades'.

We can mention two examples of the usefulness of the stock-flow consistent approach, one directly related to the GPM and the other indirectly so related. To start with the latter, it can be mentioned that the post-Keynesian SFC model of Godley and Lavoie (2007b) allows to discover that an improvement in the trade competitiveness of a large country of the Eurozone vis-à-vis countries located outside of the Eurozone leads to a deterioration of the current

account balance and of the fiscal position of the countries located in the rest of the Eurozone, despite the fact that these countries see no change in their fiscal policy parameters or in the parameters determining their exports and imports. This seems to illustrate well what has occurred with Germany and the so-called peripherical countries of the Eurozone. With respect to the GPM, Cripps et al. (2011, p. 232) explain that if 'wages in peripherical countries do not keep pace with rapid growth of productivity', this will lead to a tendency towards under-consumption and unless autonomously compensated by some other component in aggregate demand, will generate 'a rising current account surplus *vis-à-vis* the rest of the world'.

Choosing the right assumptions

As Olivier Blanchard (2015), the former chief economist at the IMF, has pointed out in an interview in the *IMF Survey Magazine*, the Global Financial Crisis has made a lot of people realize that what was established or fashionable in economics was not necessarily the best, and that it was time to go back to some of the ideas and models that had been set aside or abandoned in the past. The same opinion has also been expressed by Willem Buiter (2009), the former member of the Monetary Policy Committee of the Bank of England, who has been arguing that most of what has been taught in graduate schools in macroeconomics and monetary economics over the last 30 years 'may have set back by decades serious investigations of aggregate economic behavior and economic policy-relevant understanding'. Buiter explicitly referred to models based on New Classical and New Keynesian economics, and thus to DSGE-type of models, as the kind of modelling that offers no clues as to 'how the economy works – let alone how the economy works during times of stress and financial instability'. As an alternative, Buiter refers to the works of behavioural economists, as well as that of Hyman Minsky, Tobin and Stiglitz. Robert Solow, who is sometimes considered as the father of DSGE models because of his famous growth models of the 1950s, has also repudiated DSGE models, saying that its foundations were 'dumb and dumber macroeconomics' (Solow 2003), and that adding realistic frictions did not make these models any more plausible (Solow 2008, p. 244). Paul Krugman, has repeatedly affirmed that the old IS/LM Keynesian model

provided more insights than any of the fashionable macro models based on neoclassical micro-foundations and the rational expectations hypothesis to understand what has happened to major macro aggregates over the last seven years. Blanchard, on his part, refers to the following features that provide an alternative viewpoint that may show more usefulness.

> As a result of the crisis, a hundred intellectual flowers are blooming. Some are very old flowers: Hyman Minsky's financial instability hypothesis. Kaldorian models of growth and inequality. Some propositions that would have been considered anathema in the past are being proposed by ``serious'' economists: For example, monetary financing of the fiscal deficit. Some fundamental assumptions are being challenged, for example the clean separation between cycles and trends: Hysteresis is making a comeback. Some of the econometric tools, based on a vision of the world as being stationary around a trend, are being challenged. This is all for the best. (Blanchard 2015).

All the features that Blanchard are mentioning in this quote are the bread and butter of the post-Keynesian tradition that is incorporated in the GPM. The GPM tracks the financial flows and stocks of assets and liabilities of the major sectors of the economy, and thus 'provides a method for monitoring the plausibility of ongoing financial imbalances (flows) that may or may not result in acceptable accumulation of assets and liabilities (stocks) as time goes on' (Cripps and Izurieta 2014, p. 15), thus allowing, at least partly since the non-government and non-bank sector does not decompose producing firms from the household sector, to trace down the financial instabilities and unsustainable processes that Minsky was concerned with.

Blanchard mentions the relevance of income inequality, making a reference to Kaldorian models of growth and distribution, which are based on functional distribution. Several recent studies, from unexpected quarters, meaning here the IMF and the OECD, have underlined the fact that more income inequality seems to have a negative effect on growth. Indeed, the 2013 UNCTAD Trade and Development Report (p. 68) claims that 'greater equality of income is widely expected to boost economic growth, which would provide the main impetus to consumer spending'. The Report adds that 'there is now broad agreement that growth accompanied by high or rising inequality is unsustainable in the long run', a reference to the unsustainable financial processes mentioned in the preceding paragraph. As Stiglitz (2014, p. 6)

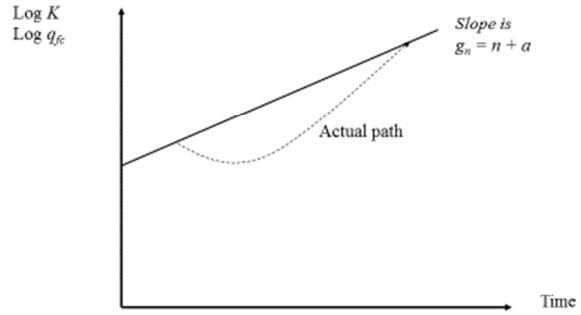
puts it, 'representative agents … assume that the distribution of income does not matter. But … distribution matters'. While the GPM does not incorporate measures of personal income inequality, it does take into account functional income distribution. The labour share has a positive impact on consumption spending through the saving function given by equation (1) of the model, as found in Cripps and Izurieta (2014). Income distribution also enters the investment function (2) through the growth of profits. With regards to the impact of changes in functional income distribution on economic activity, the GPM seems to generate results that are consistent with the results that were achieved in the large-scale study conducted for the International Labour Office (ILO) by Onaran and Galanis (2012), since Cripps and Izurieta (2014, pp. 7-8) remark that in the GPM 'the net impacts of increases in the mark-up on growth of final demand and GDP are negative, with different degrees according to the context'. Another point which their world model allows them to make is that 'the aggregation of these influences in a global model reveals large cross-border spillovers', a feature which is also emphasized by Onaran and Galanis (2012). But I won't labour the point, since Özlem Onaran herself will be assessing the GPM, presumably from that standpoint.

The third remark from Blanchard that I wish to emphasize is his reference to a return of the concept of *hysteresis* and the possible rejection of models based on the assumption of stationarity around a trend. As Blanchard (2014, p. 28) points out elsewhere, mainstream macroeconomists saw 'the economy as roughly linear, constantly subject to different shocks, constantly fluctuating, but naturally returning to its steady state over time', either through market self-correcting mechanisms or through the actions of an all-powerful central bank. In neoclassical CGE models, full employment is assumed, and the effects on output can only be achieved by efficiency or productivity gains that arise from specialization or the removal of what the modellers consider to be microeconomic distortions. In DSGE models, it is assumed that the economy will necessarily come back to its potential output, which is essentially determined by the supply of labour, set by demographics and the height of the real wage. If any change in the rate of employment occurs, it can only arise as a consequence of a short-term deviation that will be wiped out over the long run. In those models, just as in the neoclassical CGE models, output and employment can only be improved by the removal of rigidities and

distortions, where relative prices play once again the essential role. Whether discussing neoclassical CGE or DSGE models, increases in employment will be driven through the labour supply function, with higher real wages inducing more consumers to drop their leisure time and increase the time they wish to devote to work.

In the DSGE model, the economy always goes back to its NAIRU (non-accelerating inflation rate of unemployment) or NAICU (non-accelerating inflation capacity utilization), which is entirely determined by supply-side factors. Whether we are talking of neoclassical CGE static models or of the dynamic stochastic equilibrium models does not matter: these mainstream models in general do not take into account that the new equilibrium resulting from some change or shock will be influenced by what occurs during the transition from one equilibrium to the next. In other words, these models assume away path-dependence and hysteresis. They assume away the possibility that demand-led factors will have an impact on the long-run equilibrium, for instance the long-run value of potential output or the long-run value of the natural rate of unemployment. They assume away the possibility that demand-led factors can change the slope of the trend growth rate of potential output over the long run. Laurence Ball (2014, p. 149) summarizes this feature of mainstream models in the following way: 'A fall in aggregate demand causes a recession in which output drops below potential output – the normal level of production given the economy's resources and technology. This effect is temporary, however. A recession is followed by a recovery period in which output returns to potential, and potential itself is not affected significantly by the recession'. This is illustrated with Figure 1. As recognized by Paul Krugman (2009), at least until the beginnings of the Global Financial Crisis, 'self-described New Keynesian economists weren't immune to the charms of rational individuals and perfect markets. They tried to keep their deviations from neoclassical orthodoxy as limited as possible'. The standard DSGE model, designed by New Keynesian economists, has illustrated 'how Panglossian even New Keynesian economics had become'.

Figure 1: The Mainstream view
(New Consensus, DSGE)



There has always been a tradition in economics that kept rejecting this supply-led approach. It is well-known that the Keynesian tradition has put the emphasis on demand-led factors, as was pointed out earlier when discussing the structuralist strand of CGE models. This does not mean that supply factors are totally ignored. What it means instead, as implied by the following two statements from well-known Cambridge authors, is that the natural rate of growth is heavily influenced by the growth rate of demand.

> But at the same time technical progress is being speeded up to keep up with accumulation. The rate of technical progress is not a natural phenomenon that falls like the gentle rain from heaven. When there is an economic motive for raising output per man the entrepreneurs seek out inventions and improvements. Even more important than speeding up discoveries is the speeding up of the rate at which innovations are diffused. When entrepreneurs find themselves in a situation where potential markets are expanding but labour hard to find, they have every motive to increase productivity. (Robinson, 1956, p. 96)

> The stronger the urge to expand … the greater are the stresses and strains to which the economy becomes exposed; and the greater are the incentives to overcome physical limitations on production by the introduction of new techniques. Technical progress is therefore likely to be greatest in those societies where the desired rate of expansion of productive capacity … tends to exceed most the expansion of the labour force (which, as we have seen, is itself stimulated, though only up to certain limits, by the growth in production). (Kaldor, 1960, p. 237)

For instance, before the subprime financial crisis, in an interesting empirical study Leon-Ledesma and Thirlwall (2002) have shown that the natural rate of growth, which is at the heart of supply-side analyses, is in fact endogenous to the growth rate of actual output, providing evidence that the natural rate of growth rises in booms and falls in recession. As they say, 'growth creates its own resources in the form of increased labour force availability and higher productivity of the labour force' (2002, p. 452). Their results, at which they arrive by finding the GDP growth rate that leaves constant the rate of unemployment, have been confirmed by a number of other empirical studies, using the same methodology, for other regions of the world. Similar studies have yielded similar results for the three countries of North America (Perrotini and Tlatelpa, 2003), for Latin America (Libânio, 2009), and for Asia (Dray and Thirlwall, 2011).

More recently, the Global Financial Crisis has clearly illustrated that quantity effects generated by demand-led factors have had a much greater role to play than price effects coming out from supply-side factors. This has been pointed out even by some authors, such as Lawrence Summers (2014a), who in the past had succumbed to the sirens of supply-led models. Summers, as reported by Laurence Ball (2014, p. 149), went so far as to argue in a conference on full employment that 'this financial crisis has confirmed the doctrine of hysteresis more strongly than anyone might have supposed'.[3] Ball (2014) has studied the impact on potential output of the Global Financial Crisis for a sample of 23 countries. His conclusion is that 'most countries have experienced strong hysteresis effects: shortfalls of actual output from pre-recession trends have reduced potential output almost one-for one' (Ball 2014, p. 149). This, he says, has occurred through a reduction in capital accumulation, a lower labour force participation rate, and a slowdown in the growth rate of productivity. I will briefly come back on this third cause in the text below.

But these hysteresis effects have not only arisen as a consequence of the recent Global Financial Crisis. They arise in a majority of recessions. Blanchard, Ceretti and Summers (2015), in a study of over 120 recessions, assess that more than two-thirds of them have led to a

[3] As an example of this, Vítor Constâncio (2015), from the ECB, has recently pointed out that: 'At the aggregate level, the euro area output is now 20 percent below the level it would have achieved had the trend growth in the previous 15 years continued after 2007….The crisis left a permanent economic loss with broad scars in our societies'.

permanent gap between the previously estimated potential output and the after-recession estimate. In one third of the recessions, this gap was actually increasing through time, meaning that the growth rate of potential output had actually declined – a result which is consistent with the earlier work of León-Ledesma and Thirlwall (2002). Summers (2015, p. 8) has summarized this by saying that 'reversion back to trend is actually less common than evidence that the recession not only reduced the level of GDP, but reduces the trend rate of growth of GDP, what Larry Ball has referred to as super hysteresis'. Hysteresis, as it used to be mostly understood by some eclectic New Keynesian authors, and super hysteresis, as it was mostly advocated by post-Keynesian authors, are illustrated with Figure 2 and 3 respectively.

Figure 2: Hysteresis

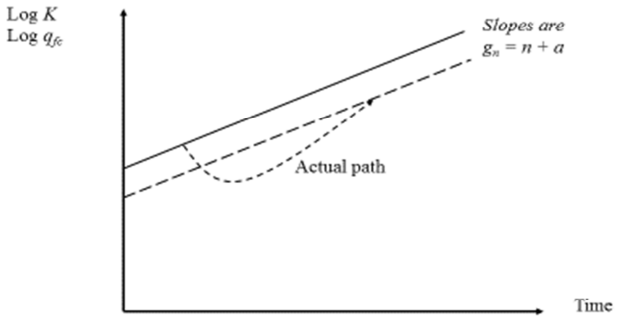
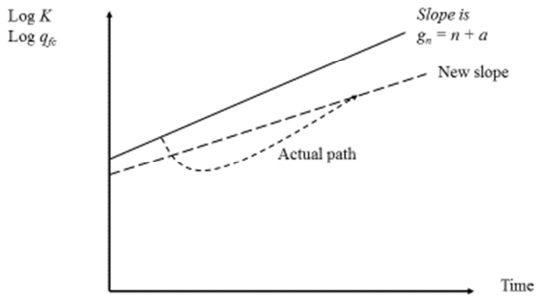


Figure 3: Super hysteresis



All this is true as well when recessions are intended and induced by restrictive anti-inflation monetary policy – a clear case of recessions caused by reductions in aggregate demand. In other words, while an observer could possibly argue that both the initial recession and the fall in future potential output had the same cause – a slowdown in productivity growth – the fact that recessions induced by restrictive monetary policy also lead to reductions in middle-run or long-run potential output shows that demand shocks also have a long-run negative impact (Blanchard et al. 2015, p. 14). In other words, the demand side does have a feedback effect on the long-run supply side. As Stiglitz (2014, p. 16) forcefully argues, 'the problem is lack of aggregate demand'. Thus, to provide a compelling analysis of what is going on, we need a model that is demand-led, while still incorporating some supply-side elements that will allow to assess the possible effects on potential output, and this is exactly what the GPM has to offer.

A major issue in economics is the choice of proper assumptions and simplifications. Keynes used to argue that this was more an 'art' than a science. What kind of model best describes the world in which we live? Mainstream economics has made the choice that it was best to assume as exogenous variables things such as the government deficit, the current account balance, and hence implicitly the size of financial saving by the private sector. In many of these mainstream models, the assumption of full employment is combined with the assumption that tax rates will adjust to balance the public budget, that investment will adjust to saving and hence that government deficits will crowd out investment, that the real wage will adjust to clear the labour market, and that the real exchange rate will adjust to insure a given current account balance (Robinson 2006, p. 211; von Arnim and Taylor 2007, pp. 16-17; Ackerman and Gallagher 2008; Taylor 2011, p. 52).

What occurred during the Global Financial Crisis? Surely, it seems reasonable to argue that we observed huge changes in output and employment, and that these changes were not caused by more capricious workers preferring leisure to work or by rising difficulties in connecting workers with employers. With the crisis we also observed huge swings in government deficits and in current account balances, while exchange rates moved around, being pushed and pulled around more by capital markets than by the evolution of trade

variables. Thus, demand-led models, much more than supply-led models, were able to capture all those features of the world economy. It is thus an absolute necessity that global demand-led models be supported by international organizations, who must not succumb to the fluctuating fads of academia in economics.

As an illustration of the utility and relevance of the GPM, the fiscal multipliers that are found at the end of the Cripps and Izurieta (2014) document describing the GPM – somewhere between 1.30 and 2.00 – are quite in line with the multiplier values that used to be found in the heyday of Keynesianism, before Monetarism and the Lucasian revolution took hold of macroeconomics, with estimations that drastically cut down the values of these fiscal multipliers. These estimates turned out to be quite wrong and under-valued when fiscal austerity was advocated and enforced during the Asian crisis, the Global financial crisis and the Eurozone crisis. This led a recanted and subdued IMF (Blanchard and Leigh 2013) to re-evaluate upwards its estimates of the fiscal multipliers, which are now roughly consistent with the values estimated by the GPM.

Conclusion

The GPM has recently been subjected to a critique, as a response to the negative assessment of trade liberalization agreements presented by Capaldo (2014), on the basis of scenarios based on the GPM. As way of a conclusion, I wish to address four of the points that Bauer and Erixon (2015) – the critics of Capaldo and of the GPM – make or raise. Capaldo (2015) has himself offered a rebuttal of the critics. These four points are the following:

(1) Contrary to supply-side models, the GPM is an aggregate demand-driven model. It was developed in the 1970s and strongly influenced by Keynesian views on the impact of changes in aggregate demand on economic activity and employment (Bauer and Erixon 2015, p. 6);

(2) [Capaldo's argument] is related to short-run transition periods, business cycle fluctuations and post-economic crises recovery period. Over the long-term, the impact

of economic growth on employment is still valid and not challenged by empirical evidence. (*ibid*, p. 7).

(3) Capaldo has chosen a model that is by and large a demand-driven model that does not make an effort to capture the supply-side effects of trade, which are the effects that are proven to be the core effects of trade liberalization. (*ibid*, p. 7).

(4) The GPM is not designed accordingly and Capaldo's view of the macro economy does not tally with modern macroeconomics. (*ibid*, p. 8).

Regarding the critique (1), enough has been said I think on the merits of keeping a demand-led approach, based on a Keynesian or structuralist CGE approach, which relies on the effects of effective demand and the impact of income distribution on aggregate demand. The fact that the GPM was developed in the 1970s or within a Keynesian framework does not make it less relevant to the world economy. Regarding critique (4), which is related, Bauer and Erixon (2015) are paying a compliment to Capaldo and the GPM by claiming that they 'do not tally with modern macroeconomics', because, as recalled earlier, several leading mainstream economists have themselves recognized that 'modern economics', understood as the developments that have occurred since the early 1980s, 'may have set back by decades serious investigations of aggregate economic behavior and economic policy-relevant understanding'. With its modelling based on a demand-led economy, within a stock-flow consistent approach that entertains both real and financial variables, including financial stocks, the GPM is certainly more policy-relevant than neoclassical CGE models or DSGE models that were designed to operate only at or near full employment, away from 'dark corners situations' as Blanchard (2014, p. 28) has put it.

Turning now to critique (2), what Bauer and Erixon (2015) are saying is that they deny the possibility of hysteresis and path-dependence, objecting to the fact that the GPM allows for such a possibility. I would argue instead that the fact that the GPM is consistent with the possibility of hysteresis makes the model especially relevant for the investigation of aggregate economic behavior and the effects of changes in economic policies or in the economic environment. In the GPM, the structure of the model and the reaction function of the central

bank are such that the economy does not necessarily come back to potential output, the NAIRU or the NAICU, as is pointed out in Cripps et al. (2011, p. 16).[4]

Finally, critique (3) claims that CGE models capture supply-side effects on productivity generated by trade while implying that the GPM is only demand-driven and does not capture possible supply effects. But this assessment is exaggerated or even mistaken on three counts. First, as pointed out by von Arnim and Taylor (2007, p. 20), the positive productivity effects that more trade is presumed to bring about rely on *ad hoc* elasticity estimates that depend on the size of exports and imports relative to the size of an industrial sector. Secondly, as it is argued by Capaldo (2015, p. 2), the GPM 'captures the possibility that capacity constraints … give way to inflationary dynamics or specific policy responses'. Price inflation is mainly determined by cost-side elements, the demand-side influence being indirect and hard to fathom. However, in the GPM, one of these cost-side elements is the price of primary commodities, determined on world markets, and the 'world price index for primary commodities responds to the rate of growth of world imports (Cripps and Izurieta, 2014, p. 12) and hence of world demand. It also turns out that there is a policy response to increased economic activity as the target interest rate is influenced by the rate of capacity utilization, as in standard Taylor rules, while the bond rate is subjected to an additional inflation premium. In addition, the real bond rate has a negative impact on real investment while the real short rate has a negative impact on inventory investment. Price inflation also slows down real consumption, as one would expect in an inflation-accounted model, and wage and price inflation also has a negative impact on market shares and hence on the volume of exports.

It can also be pointed out that supply-related issues also appear in the GPM through commodity prices, energy costs and carbon emissions, although none of these is binding for aggregate GDP. As a last comment, I should point out that Cripps et al. (2011, p. 241) claim that 'the fundamental conditions underlying supply are captured by historical estimation of technical progress triggered by the forces of domestic demand', which leads one to believe that

[4] Indeed, meta-regression analyses have concluded that there is no natural rate of unemployment towards which the actual rate would be converging and that expected inflation does not lead to a one-on-one increase in the rate of inflation (Stanley2004), that latter result being also achieved by Blanchard et al. (2015), who even show that in most countries the coefficient on lagged inflation is nearly zero in an equation attempting to explain inflation.

Kaldor-Verdoorn productivity effects are included in the GPM, meaning that the demand-driven growth rate of GDP leads to an increase in the growth rate of labour productivity. Unfortunately, the equation defining this effect, which has been retrieved time and time again in the empirical literature (McCombie 2002), is only to be found in an outside module of the GPM and was nowhere to be seen in the written description of the model by Cripps and Izurieta (2014).

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