

The scarring effects of deep recessions²¹

Können Rezessionen den langfristige Wachstumstrend einer Wirtschaft beeinflussen? Traditionelle makroökonomische Analysen vernachlässigen diese Frage, weil sie Trendwachstum und Konjunkturzyklen unabhängig voneinander betrachten. Üblicherweise werden dafür sogar unterschiedliche Modelltypen verwendet. Doch diese Denkweise wurde durch die Globale Finanzkrise (2007/2008) und die folgende „Große Rezession“ erschüttert. Die Erholungsphase danach war nämlich langsam und der Wachstumstrend dauerhaft gedämpft. Wir stellen hier ein Modell vor, in dem eine Rezession den Aufbau von Humankapital beschränken kann und somit zu bleibenden Narben im Arbeitsmarkt führt und die Produktivität beeinträchtigt. Simulationen mit unserem „neukeynesianischen Modell mit endogenem Wachstum“ erklären nicht nur die überraschenderweise wenig disinflationäre Große Rezession, sondern auch die langsame und wenig inflationäre Erholung danach. Beide Phänomene spiegeln eine flachere „Phillips-Kurve“ wider, was wiederum einem loseren Zusammenhang zwischen Arbeitslosigkeit und Inflation entspricht. Aber auch für die gegenwärtige Situation hoher Inflation lässt aus unserem Modell die Lehre ziehen, dass eine energische geldpolitische Reaktion bleibende Narben in der Wirtschaft verhindern kann.

Introduction

Traditional macroeconomic analysis is based on the idea that the long run trend in economic output and the fluctuations around this trend can be analyzed in isolation. The long run trend in economic output is meant to be explained mainly by developments in innovation, technology and human capital. In this thinking, recessions lead to fluctuations around this trend without impacting the development of the trend itself. For instance, a surprising reduction in economic confidence can lead to lower investment by firms and lower consumption by households. This reduction in aggregate demand can lead to a temporary reduction in aggregate output (measured by GDP, gross domestic output), but it is not meant to affect the long-run trajectory of GDP. In contrast, once the recession is over, catch-up growth will lead to a convergence back to the original long-run trend for output.

This predominant thinking has even led to a separation of macroeconomic models. On the one hand, models that were meant to explain the long-run growth in output were built around innovation and human capital and did not include business cycle fluctuations. On the other hand, models meant to explain business cycles and to analyze macroeconomic stabilization policy, like monetary policy, solely focused on the fluctuations around this trend. In these models, by construction, the economy would automatically return to its long run trend, and hysteresis, permanent effects of recessions, was impossible.

This line of reasoning received a hard hit due to the experience in and after the financial crisis of 2007/08, initiated by the collapse of Lehman Brothers, and also dubbed the ‘Great Recession’. The recovery from this deep and global recession was slower than many had expected and did not lead to the kind of catch-up-growth discussed above. Instead, the deep recession pushed most countries on a lower growth trajectory. Put differently, the Great Recession has led to a permanent reduction in GDP, relative to the pre-crisis trend, that is not possible in most business cycle models. However, recent empirical analyses have shown, that this kind of hysteresis is not confined to the great recession, but that it instead applied to many episodes of deep recessions.²²

²¹ Autor: Wolfgang Lechthaler (International Economics Section).

²² For a recent survey see Cerra, Fatas and Saxena, *Hysteresis and business cycles*, Journal of Economic Literature, forthcoming.

The long-standing division in the analysis of long-run trend and short-run fluctuations seemed no longer tenable.

This has led us to initiate the development of a new model that is able to combine business cycle fluctuations with shifts in the long run trend of GDP.²³ Specifically, our model is based on human capital accumulation via learning-by-doing. In our model, a recession can reduce the accumulation of human capital, thus inducing permanent scars to the labor market and a permanently lower level of real GDP. The model cannot only replicate the slow recovery after the Great Recession, but also the surprising lack of deflation during the recession and the lack of inflation during the recovery. While the model was intended to explain developments in and after the Great Recession, it also bears lessons for the current situation.

The model

Here we provide a short non-technical summary of the main features of the model. For a full description of the model, please refer to the underlying research paper, Lechthaler and Tesfaselassie (forthcoming).²⁴

The model belongs to the class of New Keynesian models, the workhorse model for the analysis of monetary policy. While in real business cycle models, monetary policy is irrelevant due to full flexibility in prices, the main feature in New Keynesian models is the sluggish adjustment of nominal prices and/or wages, which gives rise to real effects of monetary policy in the short run. In case of an increase in the nominal interest rate, prices increase as well, but less than the nominal interest rate, so that the real interest rate (the interest rate after taking account of inflation) increases as well. This leads to a drop in aggregate demand, eventually inducing a recession.²⁵

We augment the model by frictional unemployment, human capital accumulation, and skill loss through long-term unemployment. Workers that are unemployed need to search for a new job at the labor market. In turn, firms need to post costly vacancies in order to find a new worker. At the modeled labor market, a matching function randomly matches searching workers and searching firms.²⁶ The matching function is meant to capture the lengthy and costly process at which firms and workers find a suitable counterpart. Some firms and workers will remain unsuccessful in the process and need to search again in the next period.

We define workers that remain unemployed for more than six months as long-term unemployed and assume that long-term unemployed will lose some of their skills. This necessitates investment in their skills upon take-up of a new job, i.e., long-term unemployed need training before starting a new job. This is the skill loss aspect of our model.

Additionally, our model features a learning-by-doing mechanism, following Stadler (AER, 1990). It is one of the most prominent approaches to introduce endogenous growth into

²³ The project was started at the Kiel Institute for the World economy and received funding from the German Science Foundation. Work on the project is still ongoing.

²⁴ See Lechthaler and Tesfaselassie, *Endogenous growth, skill obsolescence, and output hysteresis in a New Keynesian model with unemployment*. Journal of Money, Credit, and Banking, forthcoming.

²⁵ In a real business cycle model, prices would increase one-to-one with the nominal interest rate, leaving the real interest rate and other real variables unaffected.

²⁶ Diamond, Mortensen and Pissarides received the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel in 2010 for developing this model. Today it is the most prominent approach to model involuntary unemployment.

macroeconomic models. Endogenous growth is crucial in our context, because otherwise, business cycle fluctuations are irrelevant for long-term growth by construction. Here the idea is that workers generate human capital on the job, by learning and developing new knowledge while active at work (learning-by-doing). The higher is employment, the more workers are involved in learning-by-doing and thus the higher is the growth in human capital. During a recession unemployment goes up, and employment goes down. This reduces the accumulation of human capital and thus leads to a permanently lower level in human capital and productivity, even once the economy has recovered from the recession.

Results

We implement the model in the computer software Matlab and simulate the response of the model economy to a recessionary shock. The result is illustrated in figure 1 below, which plots the development of some variables of interest over time, with quarters on the horizontal axis and deviations from the long-run growth path on the vertical axis. The graph also compares the development of the model economy (solid line) to the standard model without endogenous growth and skill-loss from long-term unemployment (dashed line).

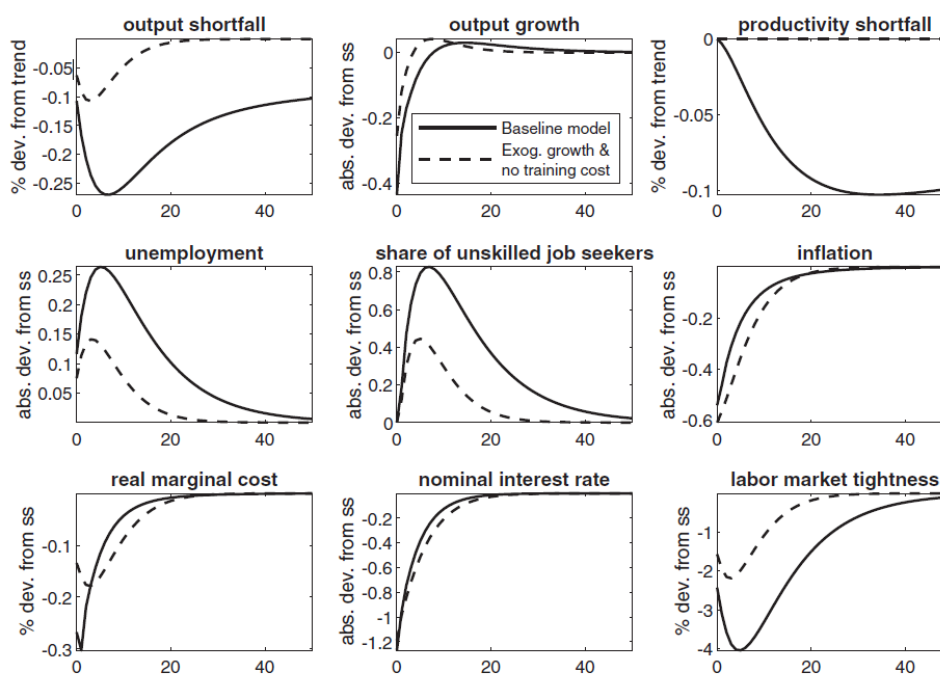


Figure 1: Recession with and without endogenous growth.

Several interesting insights emerge from figure 1.

1. The recession in the new model with endogenous growth is considerably stronger and more persistent than in the standard model: On impact the reduction in output growth is about twice as strong and output growth in the new model remains below output growth in the standard model for several periods.
2. In the model with endogenous growth the recession implies a permanent reduction in aggregate output as illustrated by output shortfall, which is defined as the difference between actual GDP and GDP as it would have been in the absence of the recessionary shock. In the standard model, trend growth is not affected by the recession so that the economy returns to its previous trend. This is different in the model with endogenous growth because higher unemployment during the recession implies fewer opportunities

for learning-by-doing and thus lower productivity. This is illustrated by productivity shortfall, which is defined analogously to output shortfall.

3. In the model with endogenous growth, the labor market fares much worse than in the standard model, with unemployment rising much higher and staying elevated for much longer. This result is mainly explained by the presence of skill loss and training costs. In the economic downturn, fewer workers are hired, and unemployment goes up. This implies stronger skill loss, which in turn raises expected training costs. This sets off a vicious circle, because it further reduces the incentives to hire workers, raises unemployment and intensifies skill loss.
4. Even though the reduction in output is larger in the model with endogenous growth, the disinflation is weaker. In a recession, aggregate demand goes down with moderating effects on prices. In the model with endogenous growth, this effect is dampened, because both the induced skill loss and reduced productivity act inflationary.

It is the last result that is probably the most surprising one, because typically stronger reactions in output are associated with stronger reactions in prices. This is related to the missing-disinflation-puzzle during the Great Recession that turned into the missing-inflation-puzzle during the subsequent recovery. In both cases the puzzle was that the fluctuations in inflation were surprisingly modest, given the large fluctuations in economic activity. The model with endogenous growth and skill loss can provide an explanation for this phenomenon because it leads to larger swings in output and smaller fluctuations in inflation relative to standard business cycle models with exogenous growth.

A corollary to this result is that the model generates a flatter Philips curve relative to the standard model. This is illustrated in figure 2, which shows combinations of inflation and unemployment from stochastic simulations of both models. Obviously, the Philips curve is flatter for the model with endogenous growth, meaning that larger fluctuations in unemployment can go hand in hand with lower fluctuations in inflation.

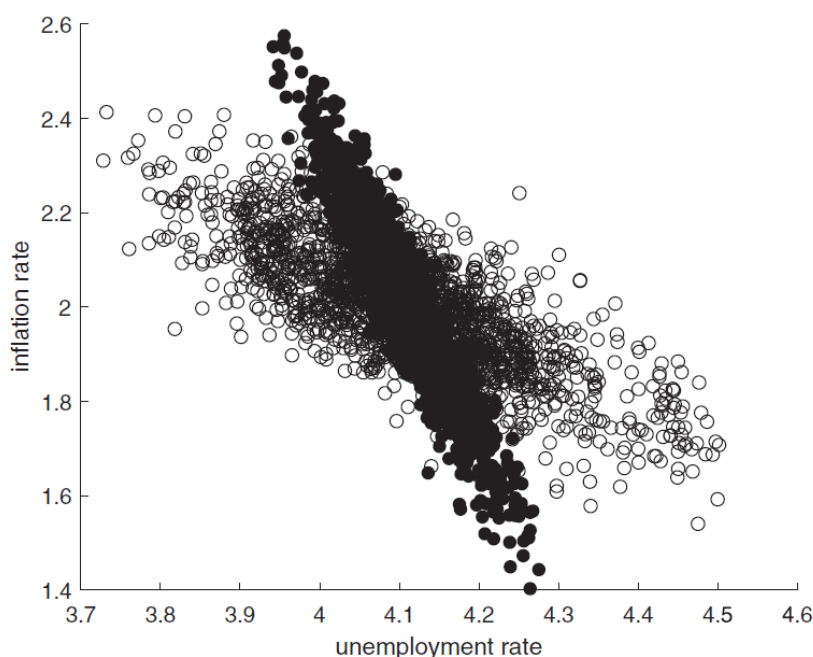


Figure 2: The Philips curve.

Empty circles: model with end. growth; filled circles: model with exog. growth

Conclusion

Recent experience and empirical analyses have shown that the separation of trend growth and business cycles is not an innocuous assumption. To deal with related phenomena we have developed a model that unifies the analysis of changes in the long-run trend of growth and business cycle fluctuations. The model gives a rationale for how deep recession can induce permanent scars on the economy.

What are the lessons learned for the current challenging situation with rising costs of energy and surging inflation? On the one hand, our model provides a rationale for an aggressive stance towards fighting recessions, since recessions can have permanent negative effects on human capital and productivity. However, in the current situation with high inflation and still low unemployment, a de-anchoring of inflation expectations is to be avoided, because this would necessitate a strong reaction of monetary policy in the future and potentially a severe recession to come, with all the problems of skill loss and human capital depreciation.

A further lesson from our analysis is that growth trends from the past are not guaranteed to hold in the future, which makes it harder to evaluate the level of potential output and the associated output gap.