

Comments on “The analytics of the Greek crisis”, by Pierre Olivier Gourinchas, Thomas Philippon, and Dimitri Vayanos, presented at the NBER Macroeconomics Annual Conference, April 2016

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This is an extremely ambitious paper. The Greek drama is one of the most complex macroeconomic developments of the last 10 years. Before I read the paper, my tight prior was that DSGE models were not at a stage where they could handle the relevant complexity. After reading the paper, my posterior is substantially more favorable. In the right hands, DSGE models can shed light even on such complex developments and, while they may not deliver definitive answers, they can lead to a much more interesting discussion. I have learned a lot from the paper.

I have organized my discussion as follows. First, I go through the many mechanisms at work when a country confronts the end of a boom under fixed exchange rates (here, a common currency). My purpose is to show the many dimensions of the adjustment process. Then, I examine how close the DSGE model captures the relevant mechanisms, what the model tells us about Greece, and whether we should believe its conclusions.

The end of booms under fixed exchange rates

By the end of a boom, a country operating under fixed exchange rates typically suffers from three related imbalances. First is overvaluation. Second is a large current account deficit. Third is high debt. Debt may be private or public. Households may have borrowed too much to buy houses or simply to increase consumption; firms may have borrowed too much to finance investment; the government may have gone on a spending spree, leading to large deficits and a large increase in public debt.

All three imbalances were very much present in Greece at the start of the crisis. Average output growth from 1996 to 2008 was a high 4%. Average inflation (measured by the CPI) was also 4%, so 2% above the average euro inflation rate, leading to steady real appreciation. In 2008, the current account deficit was equal to 14% of GDP. The fiscal deficit was 14.5% of GDP, and public debt stood at 108% of GDP.

Booms come to an end in two ways.

First, they can die of old age. While the country can still borrow abroad, the factors behind the boom fade or reverse. The high real exchange rate implies low external demand, and internal demand slows down or even decreases. This may be because reality takes over, and expectations of a bright future are revised downwards, leading to lower demand. Or the accelerator effect behind the housing boom or the increase in durable goods comes to an end. Or the government embarks on fiscal consolidation. All of these lead to a slump and an increase in unemployment.

This starts a typically painful process of adjustment. Relative prices have to adjust; competitiveness has to be restored, the current account deficit has to be reduced. Under fixed exchange rates, this has to happen through a decrease in domestic prices relative to those of competitor countries. Consider the steps in turn:

The best adjustment path, if it can be achieved, is to reestablish competitiveness through higher productivity growth. Thus, the frequent call for structural reforms by the European commission or the IMF. The political room for major structural reforms in the middle of a slump is however limited. De facto, most the adjustment process has to happen through the adjustment of nominal wages.

Short of social pacts, which are nearly never seen, and short of a coordinated decrease in wages and prices, unemployment is what puts downward pressure on nominal wages; how strong the pressure is depends on the degree of nominal and real wage rigidities, reflected not only in the strength of the response of nominal wages to unemployment, but also the relevance of the zero lower bound on wage decreases.

The decrease in wages has then to passthrough to prices. The passthrough depends on the market structure, for example on whether exporting firms are price takers or price makers in foreign markets. One of the surprising features of adjustment within the euro zone has been the limited passthrough from unit labor costs to prices. An interesting hypothesis is that firms, squeezed for profits because of the decrease in output, and more financially constrained because of tight credit supply, have decided to increase current profits at the expense of future profits. Whatever the reason, incomplete passthrough has slowed down the improvement in competitiveness and the improvement in external demand.

The improvement in relative prices then leads to an increase in external demand. Here again, many elements are at play. The size of the export sector is clearly crucial: The more closed the economy, the smaller the effect. The nature of exports is also essential: The elasticity of demand for tourism or for olive oil may be quite different from the elasticity of demand for cars.

Even if external demand improves, internal demand may be adversely affected by the adjustment process. Lower inflation---or even deflation in the current context---leads to higher real interest rates and thus lower spending. Deflation also increases the value of the debt. In the context of high debt to start with, this may slow or even derail the adjustment. The improvement in external demand may be more than offset by a decrease in internal demand.

Why did I go through all these steps? To make the point that, even if there had not been a sudden stop in Greece, there was a need for a large adjustment process, and that process would likely have been long and painful. Given that there was a sudden stop, we do not know what would have happened, but we can look at the case of Portugal. Portugal's boom ended in 2001, and, six years later, by the time the financial crisis started, little adjustment had taken place. Unemployment had increased from 4% in 2001 to 7.7% in 2007; average productivity growth over the period was less than 0.2%. Unit labor costs had further increased relative to the euro by 13%, and the current account deficit had further increased, from 5% to 10%. Many of the structural characteristics of Portugal are shared by Greece, among them a narrow export base and a slow adjustment of nominal wages. There is little reason to think that, absent the sudden stop, things would have turned out much better in Greece than they did in Portugal in the first half of the 2000s.

The other way in which booms end is with a sudden stop: Creditors start having doubts about the solvency of some of the debtors. They ask for large spreads, or they cut lending altogether. Not all sudden stops are the same. The nature of the debtor matters:

The sudden stop may affect the government. What combination of public debt and deficits trigger doubts is hard to predict: Debt sustainability is a probabilistic concept, and probability is typically hard to assess. The possibility of self-fulfilling liquidity runs makes it even harder to predict whether and when investors will be reluctant to rollover debt and ask for higher spreads. When the doubts are

triggered and spreads rise, what was a difficult fiscal situation becomes intractable. What happens next varies depending on restructuring and on outside help. If the country is on its own, wants to maintain parity, and does not want to restructure its debt, the outcome is an extreme fiscal consolidation, with its predictable adverse effects on output. If creditors agree to a debt restructuring, the pressure to adjust is smaller. And if the country gets into a program with the IMF or other official creditors, outside funds can help smooth the adjustment. In most cases, the outcome is likely to be a strong fiscal consolidation, with its attendant effects on output.

This discussion is clearly relevant for Greece. Worries about public debt sustainability led to an increase in interest rates, and by May 2010, the starting date of the first Troika program, the 10-year yield had reached 9%. By January 2012, the yield reached a peak of 35%. It would be wrong however to assume that the high rates on the secondary market were the main driver of fiscal policy. From May 2010 on, Greece had access to official financing at much lower rates, and rates on the secondary market were de facto irrelevant. What determined the adjustment of fiscal policy was the amount of financing provided by the program. While very large, namely 110 billion euros for the first program in 2010 and another 130 billion euros for the second program in 2012 (relative to a GDP of about 200 billion euros), it still required a very dramatic fiscal consolidation.

Debt restructuring was delayed, taking place only in 2012, leading to a haircut of about 50%, and reducing the debt by about 100 billion euros. One issue is how costly this delay was to Greece, how much it worsened the adjustment. The answer depends very much on the cost of public debt overhang on private demand. This is another dimension of adjustment which is important, but poorly understood.

The sudden stop may affect banks. Here again, solvency and liquidity issues are likely to combine. The slump decreases the value of the assets. Worries about solvency lead depositors and other creditors to take out their funds. Again, the possibility of self-fulfilling liquidity runs introduces substantial uncertainty as to whether and when banks will survive. Even if they do, lower capital lead to a sharp contraction of credit. To the extent that banks hold sovereign bonds, and investors believe that the state will bail out the banks, “doom loops”, interactions between doubts about public debt sustainability and doubts about bank solvency, can slow or derail the adjustment.

The decrease in liabilities of Greek banks was more of a slow stop than a sudden stop. Demand deposits did not decrease much until 2011, although deposits with maturity up to a year did. When currency risk became more acute, and demand deposits starting decreasing, it was more like a walk than like a run. Also, foreign banks did not withdraw funds to their Greek subsidiaries; indeed, they initially increased them. And when Greek banks needed to borrow, they were able to get funds first from the ECB, and then, when eligible collateral became scarce, from the Greek central bank through ELA. Just as for the government, the rates at which Greek banks could borrow were not the market rates, but rather the low rates charged by the ECB, and the slightly higher rates charged by the Greek central bank. Nevertheless, increasing non-performing loans due to slump, and the resulting decrease in capital, led to a sharp contraction in credit supply.

Finally, the sudden stop may come from doubts about the peg, or in the case of a common currency, the perception of a positive probability of exit and depreciation. Even if foreign creditors, official or private, continue to lend at low rates in terms of foreign currency, the implicit interest rate facing borrowers can increase substantially. National deposit insurance, which offers protection against losses in domestic

currency, does not offer protection against a depreciation, so depositors have an incentive to run. Beyond interest rate effects, the option value of waiting increases, and is likely to lead to lower investment. The adjustment process can again be derailed.

Whenever the adjustment leads to a large decline in output, the perceived probability that the country will give up the peg increases. Indeed, this has been the case in Greece. Both in 2012, and then again after the election of Tsipras in 2015, the perceived probability of Grexit increased. Anecdotal evidence (I do not know of formal empirical work on it) suggests that the effects on activity were substantial. Withdrawals of bank deposits accelerated. Investment decreased further. As the paper rightly emphasizes, perhaps the most striking number of the Greek crisis is the decrease in the ratio of investment to GDP, from a peak of 26% in 2007 to 9% in 2015.

Greece and the DSGE model.

I insisted intentionally on the complexity of the adjustment mechanism. The purpose of a model, even a DSGE model, is not however to capture all the intricate details, but the essential features of the mechanisms at work, and to focus on a few central questions. In the case of Greece, I see three central questions:

1. From 2008 to 2015, output decreased by about 18%. What was the role of fiscal consolidation, a question that has been at the center of the main controversies?
2. What other factors played a role in explaining the decline in output?
3. Given the situation Greece was in at the start of the crisis, how bad did the adjustment have to be anyway?

Does the DSGE model presented in the paper convincingly answer these three questions? My answer is “not yet.” But it yields a rich discussion, and a structure to build on. Let me develop these arguments, starting with a discussion of the specification and estimation of the model.

There is no question that the specification of the model represents major progress. The model has the essential features needed to answer the questions above. It has two goods, domestic and foreign, so we can think about relative price adjustment. It has nominal rigidities, so the adjustment is slow. Rather than being a representative agent model, it has savers and borrowers, so one can think about financial intermediation. It has intermediation by banks. It allows for endogenous default risk, for the government, for banks, for firms, and for households. It has rich interactions between the different default risks, and captures various “doom loops”: For example, higher default risk for firms leads to lower investment, which leads to lower output, which leads to higher default risk for the government. From a methodological viewpoint, it is an impressive achievement. Those who are religious about strict micro foundations may object to a number of shortcuts taken in formalizing the behavior of banks and the determination of the various spreads, but the shortcuts strike me as reasonable and a fully micro-based treatment is probably beyond reach at this point.

The authors face however a major specification issue: Their model is not a model of a country with a Troika program. Much of what happened in Greece from 2010 on has been determined by the two programs, rather than by decisions of the Greek government or the Greek banks. The authors make the choice of ignoring this aspect. This may well be the right choice in showing what a model with default

risk can do, but it creates problems of interpretation when applied to Greece, problems which I shall return to below:

They capture the stance of fiscal policy by a rule determining the deficit as a function of debt, of the cost of borrowing measured by the spread on Greek sovereign bonds, and of a fiscal shock. But, in fact, the stance of fiscal policy has been mostly determined by the amount of funding given by the Troika, and the interest rate at which the government has obtained this funding has been much lower than the rate on the secondary market for Greek government bonds. This makes the interpretation of “fiscal shocks”, estimated as residuals from a nonexistent rule, rather difficult.

A related problem concerns banks. In the model, the rate at which banks can borrow depends on their default risk and on a funding shock (which the authors also call a sudden stop shock). The banks pass that cost on to their customers, so the rate at which banks can borrow determines the rate at which people and firms can borrow, adjusted for their own default risk. In the estimated model, much of the increase in the rate at which people and firms can borrow is interpreted as coming from an increase in the funding rate of banks. But, in fact, as we saw earlier, Greek banks have been able to borrow at low rates throughout, either from the ECB or from the Greek central bank. The implication is that the increase in spreads on lending to firms and households does not reflect a funding shock, but rather something else in the banking sector, probably the effects of losses on capital and in turn on credit supply. This makes the interpretation of the estimated funding shock difficult. It may capture the effect of a probability of euro exit; but in this case, it would affect other variables in the model, from the cost of borrowing by the government, to investment.

Turning to calibration and estimation, I have the same negative reaction I have to similar calibrations and estimations in other DSGEs. It is again an impressive technological tour de force. But it is nearly impossible for the reader (at least for this reader) to get a good sense of the plausibility of the estimated/calibrated parameters, and, by implication, of the estimated shocks. Getting a sense of the various choices, be it which parameters are calibrated and which ones are estimated, which variables are chosen to be used for the estimation of shocks and which are left aside, how robust the results are to assumptions, is difficult. I understand that it would take a much longer paper (or a very long appendix) to discuss and defend the various choices, but it makes it difficult to assess the results. Some of the choices strike me as debatable. To take a few examples: It cannot be right to use the same Calvo specification for wages in every country (or maybe for any country). The best way to find out what the fiscal multipliers were in Greece since 2007 cannot be to estimate the full DSGE model. Some implications of the calibration seem implausible. The elasticity of investment with respect to interest rates seems too large: A 60 basis point increase in the rate appears to decrease investment by 8%, output by 3%. This plays an important role in the results. I believe that general equilibrium Bayesian estimation just asks too much of the data, and is too much of a black box. Both from a communication viewpoint, and from a robustness viewpoint, I believe that much of the needed evidence must be collected through careful partial equilibrium, equation by equation, estimation, before we can run DSGEs with enough comfort. (I think it can be done. Indeed, an IV approach to estimation was followed by one of the authors (Martin and Philippon 2015) in a related paper.)

Let me now go back to the three questions about Greece posed earlier. What does the model tell us?

Take the role of fiscal policy, both in the boom and in the bust. Figure 18 presents the decomposition of movements in output as a result of the underlying shocks. And, on the face of it, it yields a surprising conclusion. While much of the pre-crisis increase in output is attributed to positive fiscal spending shocks, relatively little of the fall in output since then is attributed to negative fiscal shocks. Why is this? The authors explain it well. Shocks are defined as deviations of spending from the (postulated) fiscal rule. And given that the rule makes spending depend on the rate on sovereign bonds, it implies that, even in the absence of fiscal shocks, the large increase in spreads would have implied a large fiscal consolidation. The logic is fine. But the conclusion is potentially misleading. If we defined the fiscal spending shocks instead as the change in the cyclically adjusted primary surplus imposed by the Troika programs, they would account for much more of the decline in output. (One other aspect of the decomposition also puzzles me. The buildup in debt from 2010 to today is attributed nearly fully to positive spending shocks, which took place before the crisis. I find the long lags difficult to believe.)

Take the role of other shocks. Particularly interesting is the role of markup shocks. As discussed earlier, one of the puzzling features of the adjustment has been the limited passthrough of wages to prices, slowing the competitiveness adjustment. Surprisingly (and with a slight tension between text and Figure 18), markup shocks play a limited role in accounting for the decline in output. (The model allows for an effect of financial conditions on marginal cost, through the use of working capital in production. Higher spreads imply higher costs, and thus an increase in prices relative to wages. This is an interesting angle, but will need to be documented at more directly). Negative markup shocks, that is incomplete passthrough of increases in wages into prices however play a substantial role in the pre-crisis build up in output. This is a new angle in the discussion, and worth exploring further.

Finally, given where Greece was when the crisis started, how painful would the adjustment have been absent further shocks? I asked the authors to see what the model implied, by setting all the shocks equal to zero from 2010 on, so the dynamics from then on only depend on the state variables in 2009. They kindly did it, and the results are shown in the attached figure. The conclusion is that, despite the buildup of debt and the initial overvaluation, the contraction in output would have been substantially smaller. The mechanism behind the result however is suspicious. One would have expected that, in the absence of sovereign risk shocks and fiscal spending shocks, the adjustment of government spending would be smaller, leading to a smaller output contraction. This however is not the main mechanism at play. Government spending without shocks is nearly the same as with shocks. The main difference is in the behavior of investment, which falls much less than in the presence of shocks. This in turn is due to turning off the funding cost shock, and the large elasticity of investment to the funding cost; as discussed earlier, I am skeptical about the interpretation of the funding cost shock, and the elasticity of investment, and thus skeptical about the conclusion.

[Figure. Counterfactual simulation. No shocks after 2010. {8 series. GDP, Investment, Net Exports/GDP, Govt. Spending, Funding Cost, NPL, Govt. Yield, Household Debt}]

Lest my comments appear too negative, let me repeat what I said at the start. The model developed in this paper is not at the stage where it will settle debates about what lies behind the Greek depression. But it has an extremely rich structure, which can be built on and lead to a much more interesting discussion of what has happened in Greece in the last 15 years.

References

Philippe Martin and Thomas Philippon, "Inspecting the Mechanism: Leverage and the Great Recession in the Eurozone", manuscript NYU, May 2015.



