Fiscal Discipline as a Social Norm: The European Stability Pact

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Abstract

Thispaper reviews the arguments for and against the "Stability and Growth Pact." We find the theoretical debate to be inconclusive, as both externality and credibility arguments can be used to yield opposite and plausible conclusions. Empirical evidence in favor of a Pact-like rule is also scant. We therefore suggest the view that the Stability Pact is a public social norm, that countries obey in order to preserve reputation among the other members of the European Union. Using this extreme—but not implausible—hypothesis, we build a simple model similar in spirit to Akerlof's (1980) seminal work on social norms, and we show that reputation issues may cause the emergence of a stable but inferior equilibrium. Increased heterogenity generally has the effect of further reducing aggregate welfare; we conclude that the problems posed by the Pact/social norm are likely to increase following the enlargement, when a number of countries anxious to prove their "soundness" joined the club.

1. Introduction

In a seminal contribution on fair wages and unemployment, Akerlof (1980) showed that social norms can persist, even when costly to follow for individuals, if disobedience entails a loss of reputation. This paper extends to

public behavior the argument developed by Akerlof. We maintain that "public social norms" may limit the ability of national governments to maneuver when building and managing an economic and monetary union, and yet survive because of reputation considerations. More specifically, the public social norm we consider in this paper is the Stability and Growth Pact (SGP), signed in 1997 by the countries participating in the European Monetary Union.

Social norms and their effect on economic behavior and outcomes have been investigated at length. The essays collected by Hechter and Opp (2001a) show the variety of definitions of social norms, and the disagreement among scholars about their emergence and persistence. We do not intend to enter into this debate, but since we claim that the Stability Pact is, in fact, a social norm, we need to clarify some of the general features of norms.

At the core of the literature on norms is the observation that the need for social acceptance contributes to determine individual behavior. Social psychologists have long studied group behavior, and the tendency to conformity. In a series of experiments Asch (1951) shows that members of a group, even when capable of making the right choice when deciding in isolation, tend to conform to group decisions regardless of whether they are correct or not. One of the explanations for group conformity (e.g., Buchanan and Huczynski 1997) may be that groups establish social norms, and punish deviation. This set of findings serves as a justification for Harsanyi's (1969) postulate that social recognition plays a role along with economic gain in determining the behavior of economic agents. In other words, "persons want to be rich *and famous*—the *and-famous* part of the expression not being redundant' (Akerlof 1980, p. 753).

Harsanyi's postulate underlies Pettit's (1990) classic definition of norms: regularity in behavior is a norm if: *first*, members of the society generally conform to it; *second*, deviance is disapproved; *third*, the fact that most people conform to the norm helps enforcing it. This definition has two important consequences. The first is that agents may follow the social norm even when it is against their own economic interest, if the gain in reputation or social esteem is sufficiently large.[1] What matters is a concern for reputation rather than an immediate impact on private (or social) welfare. The second and related consequence is that the norm does not necessarily originate within the sphere of investigation of economics: scholars seem to agree on the fact that the emergence of social norms depends on socio-historical conditions, and, as such, it is case specific (Hechter and Opp 2001b). Thus, when discussing the norm "Stability Pact" below, we will give some reasons that may explain why that specific norm emerged in the first place.

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[1]Contrary to the game theoretic literature, that defines reputation as the coherence between *ex ante* and *ex post* behavior (reputation is equivalent to credibility), the literature on social norms defines reputation in more general terms, as the positive effect on welfare coming from the acceptance by other members of the community.

Akerlof's model fits in this discussion. Firms, fearing a loss of reputation, are willing to pay a wage perceived as "fair" and higher than the market clearing one, thus obtaining suboptimal profits; on aggregate, this causes involuntary unemployment. In other words Akerlof shows how freely obeyed social norms may result in constraints on individual behavior as well as in departures from the optimal equilibrium.

The presence of reputation in the utility function could of course be seen as the result of a "meta-maximization" problem in which reputation serves as a means towards other ends (Becker 1976). Thus, in Akerlof, firms could be induced to offer fair wages by the fear of losing skilled workers and ultimately incurring in lower profits. The economic and reputation incentives would thus be impossible to disentangle. Nevertheless, Elster (1989) warns against the temptation to think that norms can always be treated as any other element in the utility maximization process. He gives examples of norms, hard to reconcile with self or common interest, that are nevertheless obeyed.[2] Elster argues forcefully that "to accept social norms as a motivational mechanism is not to deny the importance of rational choice. [...] Actions typically are influenced both by rationality and by norm. Sometimes, the outcome is a compromise between what the norm prescribes and what rationality dictates. [...] At other times rationality acts as a constraint on social norms. [...] Conversely social norm can act as a constraint on rationality." (Elster 1989, p. 102).[3]

The transition towards the European Monetary Union was dominated by the Maastricht criteria (in particular limits to deficit and debt), later crystallized in the SGP constraints. These were accepted even by governments which were opposed to their design; many countries encountered serious problems conforming to the criteria, and the only immediately visible benefit was the increased reputation of their governments among their peers (but not necessarily with their electorate). This is why we argue that the current fiscal setting has the features of a social norm, in that governments follow its prescriptions primarily because the others are following it. We make this working hypothesis because it is difficult to be convinced by the rationale underlying the European economic government. We will show that the theoretical debate on the need of supranational fiscal rules, as well as the empirical evidence, is inconclusive, so that some other explanation for the persistence of the SGP deserves at least to be explored.

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[2]A trivial, and yet forceful, example is that bus riders do not pick their nose. They want other passengers to think that they "know how to behave," even if they will never meet again.

[3]Elster echoes a tradition on social norms rejecting the utilitarian (or functional) approach that we describe in the text. For authors like Habermas and Rawls the social norm emerges when individuals accept limitations to their behavior in order to form a community. Thus, norms mark the passage from the state of nature to civil society (Forsé and Parodi 2005). This approach, dominant in sociology, is a minority view in economics.

The question of why governments have accepted such a constraining fiscal rule is all the more important because in a monetary union national governments lose their control on interest and exchange rates, and fiscal policy is one of the few instruments left. Furthermore, the single EMU interest rate has differentiated effects on the dynamics of public debt: countries "enjoying" the lowest rate of inflation will suffer from the highest level of real interest rate.

The reputation argument is not as odd as it may look at first glance. The design of European institutions is such that decisions in most fields are the outcome of a bargaining process between the different governments. Thus, credibility and the bargaining power of each government may depend on reputation among its peers (the meta-maximization problem defined above). If a government wants to earn or maintain a good reputation, for example in order to use it in other negotiation venues, then it may be valuable to obey a norm that is not directly beneficial, simply because it is followed by the other governments. We argue in other words that the European Council resembles a Club where members obey a social norm to earn social acceptance.

In light of these considerations, the enlargement that took place in May 2004 is a major source of concern (see also Buiter and Grafe 2004). It is plausible that, with the increase of heterogeneity, the need of stabilization policies to cushion asymmetric shocks will increase, as will do the cost of obeying a norm that limits such policies. If the norm is strong enough to resist the increased pressure, then the negative welfare consequences for the EU may be substantial.

The paper is structured as follows: the next section briefly describes the provisions of the Stability and Growth Pact, discusses the theoretical arguments underlying the Pact, and argues for their inconclusiveness. Then, in Section 3, we highlight a number of features of the SGP that corroborate our interpretation as a social norm. Our model, a simple extension of Akerlof (1980) in which obedience to the norm is induced by reputation considerations, is presented in Sections 4 and 5, where we also show the effects of enlargement when a norm like the Pact is in place. Section 6 concludes and suggests themes for further research.

2. The Debate on Fiscal Rules and on the Stability Pact

The institutions of Europe, in their actual design, stem from two main sources. The first is the founding Treaty signed in Maastricht in 1991, and the second is the Stability and Growth Pact[4] that, negotiated together with the Amsterdam Treaty in 1997, completes the setup for fiscal policy.

The Maastricht Treaty defined the convergence criteria that countries had to fulfil in order to be admitted to the single currency area. In particular,

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[4]The SGP consists of a Resolution of the European Council (OJ 1997, C 236/1), and two Council Regulations (1466/97 and 1467/97)

it required a deficit to GDP ratio of no more than 3%, and a public debt below 60% of GDP, or approaching that level at a "satisfactory pace." The vagueness of the latter requirement allowed to overlook it for high debt country as Italy, Belgium and Greece. The SGP contains further provisions regarding fiscal policy that have the objective of increasing transparency and control on public finances. Each year member countries present a Stability and Convergence Programme, to be examined by the European Commission and the Council. The programmes have to contain a medium-term objective for the budgetary position of close to balance or in surplus, together with an account of the adjustment path towards the objective. The Excessive Deficit Procedure (EDP) states what deviations from the 3% budget deficit ceiling are acceptable, and gives the Council the right to sanction (by qualified majority) the infringers. The EDP has first been invoked for Portugal (for the 2001 deficit). In November 2003, the Council decision to "forgive" France and Germany, triggered an unprecedented clash with the Commission, which had recommended sanctions to be imposed. The Commission sought a judgement by European Court of Justice, that ruled against the Council in July 2004. In the spring 2004 the EDP was also invoked for The Netherlands, Greece, and six newly admitted countries, while for Italy the Council and the Commission waited June 2005. As of November 2008, no country has been sanctioned.

The requirement to attain a position of close to balance or surplus in the medium term is an important innovation with respect to the Maastricht Treaty. In fact, it implies the strong consequence that public debt as a ratio to GDP should tend asymptotically to zero (De Grauwe 2003), a position hard to justify *per se*. First, very much like private agents, governments may be willing to spread the cost of investment projects over time, in order to match the expected future pattern of returns (no private firm would find it rational to finance investment projects exclusively out of current revenues; so why ask it to governments?). Second, and specific to public finances, debt may be a tool for transferring resources across generations and/or social groups, or to finance public spending investments whose social return is larger than expected profitability. This inconsistency of the SGP has been at the root of reform proposals excluding public investment from deficit limits (the "golden rule of public finances"). A recent paper by Creel et al. (2007) analyzes the effects of public investment on growth, and discusses the application of the golden rule to the United Kingdom, where it has been successfully implemented since 1997.

The fiscal requirements of the Maastricht criteria and of the SGP had a deep influence on the pattern of public finances in European countries. Figure 1 shows the fiscal impulse for a number of countries, computed as the negative of year on year changes in cyclically adjusted government net lending, and averaged over different periods. Such an indicator measures the discretionary fiscal stance of the country, a positive number being an expansionary stance. All the Euro zone countries included in the figure, be them large or small, virtuous (Austria, Finland) or less so (France, Italy,
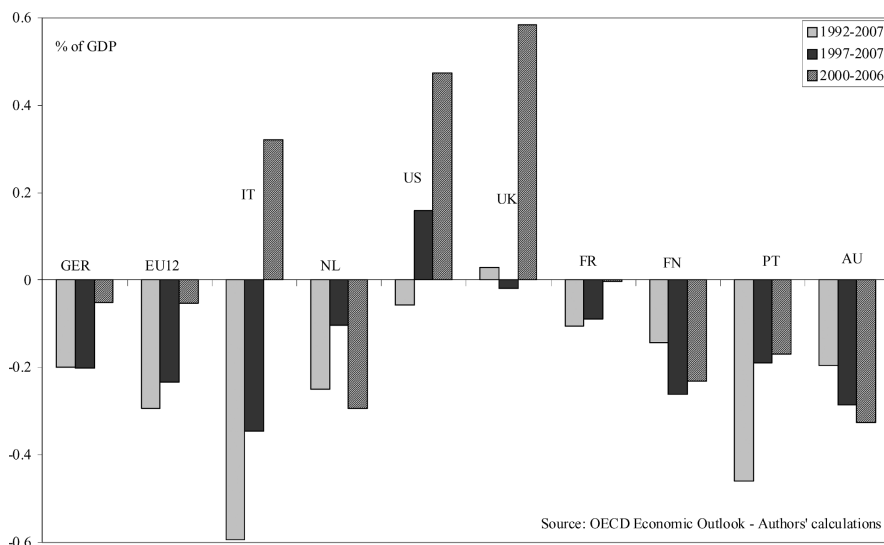
Figure 1: Fiscal impulse for selected countries, computed as minus the year on year variation of cyclically adjusted government net lending. A positive value denotes an expansionary stance in discretionary fiscal policy. Average over the 1992–2007 period and selected subsamples.

Germany, The Netherlands, Portugal), had an overall restrictive stance since the early 1990s. The heterogeneity of the countries considered leads to link this restrictive stance to the efforts for entry in the EMU in the 1990s, and for trying to respect the SGP constraints since 1997. The pattern is particularly striking if we take the subperiod 2000–2006: in spite of sluggish growth, the orientation of fiscal policy did not change, and remained restrictive. This contrasts with the United States and the United Kingdom, where fiscal policy was more reactive to economic conditions. Figure 2 shows the scatter plot of changes in the output gap against the fiscal impulse for the United States and the Euro zone. In the U.S. fiscal policy has been countercyclical (expansionary in 2001–2003 and in 2007, contractionary during the expansion of the 1990s and in 2004–2006). This pattern shows that fiscal policy has constantly been in the policy maker toolbox, regardless of the administration (the sample spans the two Clinton terms, and the Bush years so far). In the Euro zone, the consistently restrictive fiscal stance happened to be countercyclical in the second half of the 1990s. But was slightly procyclical during the difficult years at the beginning of this decade.

The prolonged period of soft growth experienced by most euro zone countries (especially the largest ones), and the increasing number of countries struggling to maintain their deficits within the limits set by the Pact, have triggered a debate on the flaws of the current fiscal framework, and on possible reforms aimed at a better functioning of fiscal policy in Europe
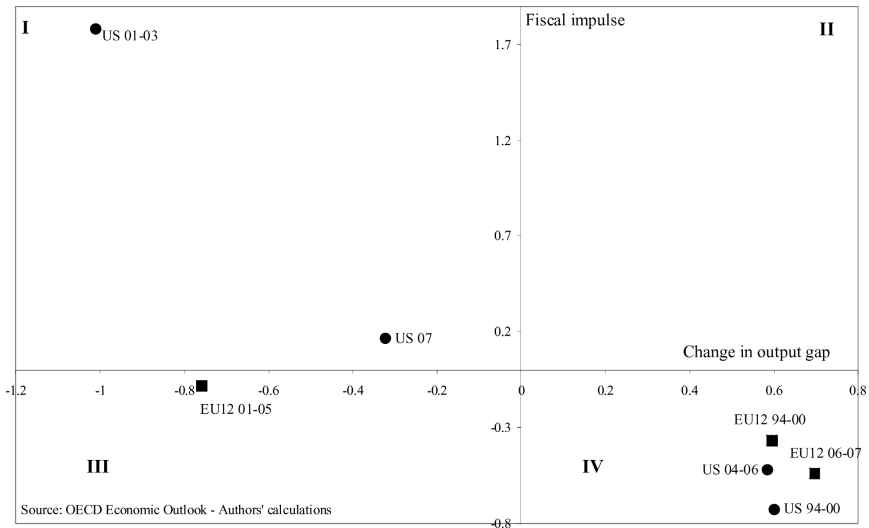
Figure 2: Euro zone (12 countries) and United States. Scatter plot of year on year changes in the output gap versus fiscal impulse (computed as in figure 1); the periods over which we average slightly differ to reflect the different cycle lengths in the two areas. Quadrant I and III (II and IV) represent countercyclical (procyclical) fiscal stances.

(for detailed accounts of the debate on reforming the Pact see Buti et al. 2005, and Monperrus-Veroni and Saraceno 2006). The constitutional Treaty signed in Rome in October 2004 had left substantially unchanged the provisions regarding fiscal and monetary policy, but the long political process has finally yielded a first result in the reform adopted by the European Council in March 2005: the 3% and 60% limits remain unchanged, and no automatic mechanism (such as a golden rule or a debt related rule) is put in place. Nevertheless, on one side the medium term objective of a zero structural deficit is slightly relaxed for countries with low debt and/or with high potential growth; and on the other the "new" Pact contemplates a number of circumstances (e.g., a strong engagement in costly structural reforms) allowing temporary deviations from the deficit ceiling, and longer delays for correcting them.

When discussing fiscal policy one should clearly separate the issue of whether it exists a *deficit bias* requiring rules to constrain fiscal policy, from the issue of whether a supranational norm like the SGP is needed. This crucial distinction has unfortunately often been neglected in the debate on the SGP. Several arguments point to the existence of a deficit bias, for example voter myopia, opportunistic behavior and dynamic inconsistency, or intergenerational conflicts. Nevertheless, the mere existence of a deficit bias is not enough to justify a supranational rule in a monetary union. In fact, economic commonsense and the principle of subsidiarity would require rules to be country-specific and left to the choice of national governments, unless

it were argued convincingly that the effects of suboptimal fiscal policy spill over to the other members of a monetary union. Thus, for our purposes we need to focus on arguments entailing some sort of spillover between countries, that would justify such a rule. In the remainder of this section we will outline strengths and weaknesses of these arguments; a detailed account of the more general debate on the utility of fiscal rules can be found in Fitoussi and Saraceno (2007).

The main theoretical foundation of the Stability Pact is a simple externality argument: a government running a budget deficit has to borrow; in a monetary union this is supposed to raise the common interest rate, and to have restrictive effects both on public expenditure (the area-wide increased interest payments reduce government consumption and investment possibilities), and on private consumption and investment in the other countries. This negative externality would induce national governments—free from the control of foreign exchange markets—to run excessive budget deficits, allowing them to make the other countries pay part of "the bill."

The empirical evidence in favor of this claim rests on several contributions concluding that expansionary fiscal policy has a positive effect on interest rates.[5] Nevertheless, a closer look reveals that this literature cannot be invoked to support the externality argument. In fact, none of these papers looks at the effects on the rates of partner countries, but only on own rates. The need for a common rule has to originate from common effects of government behavior, domestic effects having to be taken care of by national policies and/or rules. As the evidence on domestic interest rates is not extremely robust, it would be extremely surprising if a study gave empirical arguments in favor of common rules, by finding important effects of fiscal policy on interest rates at the European level.[6]

More importantly, from a theoretical viewpoint, the externality argument can be reversed. Suppose that a country implemented an unwarranted expansionary fiscal policy, while close to full employment; this would result in inflationary pressure, and hence in reduced competitiveness. If on the other hand the deficit responded to a slump in production, it would sustain demand and hence income and imports. In both cases, the increased demand for the other countries' production would yield larger fiscal revenues and lower deficits. Models with either negative or positive fiscal policy spillovers have flourished in the recent literature;[7] but nothing, from a theoretical point of view, may

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[5]To cite just the most recent ones, Laubach (2003), Ardagna et al. (2004), Canzoneri et al. (2004). These results nevertheless are not extremely robust, as other studies are inconclusive (Mehra 1992; Cunningham and Vilasuso 1994), or find negative correlation (Caporale and Williams 2002).

[6]Landon and Smith (2000) find some effect of provincial debt in Canada on the creditworthiness of the other provinces. These effects are nevertheless small, and the authors do not clearly take position between a market based and a rule based approach to fiscal discipline.

[7]Examples of negative spillovers are in Andersen and Sorensen (1995), Jensen (1996), and Catenaro and Tirelli (2000). Some rely on the adverse effect of interest rate increases

induce one to think that the negative externality would be larger in size than the positive one. Indeed simple reasoning leads to believe the contrary: generally, a fiscal expansion in a region does not have negative effects on other regions of the same country. Given the short life of the EMU, we will have to wait some more time for empirical work to help shed some light on this debate.

Interest rate spillovers may also operate through a different channel. Detken et al. (2004) show that bond substitutability in a monetary union widens the savings pool at which governments can draw to finance deficits, thus weakening the interest rate costs of excessive deficits. Governments can thus free ride in a monetary union. This mechanism, which incidentally runs against the one described above, and may explain why empirically the effects of deficit on interest rates are not robust, would call for a national rule, as the interest rate costs are paid by the country itself, and no spillovers appear.

A second argument in favor of a supranational rule is credibility: excessive deficits may end up in insolvency, forcing the European Central Bank to intervene (against its own statute) to bail out the country involved; otherwise, banks owning the debt would see their financial soundness hampered, and face the risk of depositors" runs (Artis and Winkler 1999). The moral hazard aspect of excessive deficits could hence undermine the central bank's credibility in its commitment to fight inflation. Furthermore, as the costs of an ECB bailout would be sustained by all EMU citizens, this would encourage irresponsible behavior of governments. A constraint on deficits can avoid this risk.

This argument may be dismissed on several grounds. First, a debt crisis seems scarcely plausible in the present context. Since 1945, even in far more turbulent times, European countries never seriously risked default on their debt. Furthermore, a study on OECD countries by Alesina et al. (1992) showed that markets are capable of monitoring fiscal performance and exerting pressure on governments through interest rate spreads. Bernoth et al. (2004) show more specifically that this capacity was not weakened by the inception of EMU. Eichengreen and Wyplosz (1998) further notice that, in contrast to Mexico and East Asia during the crises of the 1990s, the European banking system exposure and the term structure of public debt seem more solid, so that the bailout risk is not particularly important. They also argue that such a risk would be better dealt with by improving public debt management and bank regulation, an argument that was strengthened by the recent subprime crisis.

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described in the text, while others focus on negative terms of trade effects. The classic book by Mundell (1968) assumed positive demand spillovers, that also emerge in Dixon and Santorini (1997), and Beetsma et al. (2001). Levine and Brociner (1994) present a model in which all these externalities play a role, and argue that the negative ones probably dominate the positive ones. Allsopp et al. (1995) also discuss at length the different effects at work in a monetary union and conclude that decentralization of fiscal policy is likely to provide insufficient stabilization.

The credibility argument is also less robust than it may appear. The Pact was designed assuming that governments would accumulate surpluses in good times to allow the operation of automatic stabilizers in bad times.[8] This ideal scenario though, did not take into account at least two complications: the first, correctly predicted by Eichengreen and Wyplosz (1998), is that this symmetry would only be attained after a long transition; during this transition, which is still happening, governments are being forced to restrictive fiscal policies irrespective of the business cycle phase. To make things worse, the Pact was signed at the end of a long phase of convergence to the Maastricht criteria, that for some countries involved restrictive, and generally procyclical fiscal policies.[9] When growth later resumed, they could not continue to be restrictive. For all these reasons the Euro area economy has experienced, especially since the end of the U.S. expansion of the 1990s, an explosive combination of depressed growth and procyclical (or at best neutral) fiscal policy induced by the convergence to Maastricht criteria first, and by the Stability Pact after. Mainly because of high debt service, the three largest countries—Germany, France, and Italy—do not have room for the automatic stabilizers to play, so that fiscal policy is ineffective even facing transitory shocks. This extremely difficult situation is already resulting in creative accounting experiments, and in increasing pressure to revise, soften, or simply ignore the Pact. Even worse, the impossibility of using the fiscal instrument is inducing governments and economists to put pressure on the ECB for a more expansionary monetary stance, undermining the support for the fight against inflation. Finally, the repeated violations of the Pact, and the recent legal controversies between the Commission and the Council have further reinforced the belief that the current institutional setting is inappropriate. These phenomena seem far more threatening, for the credibility of the European institutional system as a whole, than the bailout risk.

To sum up, while the theoretical debate on the existence of deficit biases and the ensuing need for some kind of fiscal rule seem to have become consensual, the empirical foundations for such rules, and for supranational measures like the Stability Pact do not look nearly as solid. Such mixed results may explain why, in spite of the consensus in the academic profession, the instances where fiscal rules have been adopted in practice are quite rare.

3. Fiscal Discipline or Social Acceptance?

The inconclusiveness of economic arguments in favor of the SGP is at the basis of our claim that other factors, namely reputation, may be used to explain

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[8]"Nevertheless, the problem, with the Pact as presently framed is that it is all stick and no carrot; rewarding good fiscal behavior in booms rather than, or in addition to, punishing bad behavior in slumps, would certainly make better sense" (Bean 1998, p. 106).

[9]For example, France, Germany, and Italy all conducted restrictive fiscal policies in 1996 (a negative fiscal impulse), while the output gap was widening.

why most countries of the EMU have adopted strict and often procyclical fiscal policies even when suffering from low growth, and lack of policy instruments. This claim also rests on a number of features of the Pact that remind characteristics of social norms recalled in the introduction. First, the circumstances that led to the Stability Pact. Stark (2001) or Heipertz and Verdun (2004) give accurate accounts of its genesis, that could explain why reputation in the European "club" is founded on a sound fiscal position, and not on more sensible measures of public welfare, like low unemployment or high GDP growth. As happens for other social norms (e.g., what determines a "fair" wage?) the answer seems to lie in a mix of historical, social and political factors: Germany's historically strong aversion to inflation that made its government give up its monetary sovereignty only in exchange for an insurance of prudent fiscal behavior. Alternatively it could be, as many argue, the desire of core countries to keep out of the union the so-called "club Med" nations (Greece, Italy, Portugal, and Spain). Furthermore, the rule persisted even after the special circumstances that originated it have disappeared (to the point that Germany was, between 2003 and 2006, one defaulting member of the club), a sort of hysteresis that is also common among other social norms. A second element in favor of our interpretation is the sanctioning scheme associated with the Pact; sanctions are not likely to be imposed, because too heavy and delayed. In fact until now sanctions for deviating countries have simply taken the form of a public reprimand (i.e., the starting of an EDP). If this is the case then, it appears that the efforts of most countries to respect the provisions of the Pact are dictated by the need for social recognition rather than by the fear of actual costs. Whatever its origins may be, we are interested in the effects that the social norm "Stability Pact" has on government behavior and social welfare. One point should nevertheless be stressed: most private social norms have their origin in a notion of fairness, implying that agents behave in such a way as to refrain from taking full advantage of a (possibly temporary) dominant position (Hicks 1974). Social norms of this type may even been considered as a way to address the so called "zero contribution" problem, namely that "unless the number of individuals in a group is quite small, or unless there is coercion or some other special device to make individuals act in their common interest, rational, self interested individuals will not act to achieve their common or group interests." (Olson 1965, p. 2). Norms constraining public behavior may also have the same origin, the quest for common interest. But by definition -because they are written at a particular moment- they cannot reflect the outcome of a repeated game. For this reason they are often entrenched in some doctrine representing the current economic paradigm, and may survive after it disappears (the political economy explanation). The threat of social sanctions is enough to make it rational to obey the norms.

While we outlined a number of reasons why the SGP has the features of a social norm, there may be other reasons for the emergence of a suboptimal arrangement in Europe. For instance, an anti-inflationary coalition would benefit from a rule constraining demand side interventions and making supply

side interventions (structural reforms) inevitable.[10] Such a political economy interpretation is certainly convincing in explaining why the Stability Pact emerged in its current form. Nevertheless, it presupposes an ideological homogeneity of European governments and vested interests that does not seem to be observed in practice. Once we need to explain why more interventionist governments ended up accepting an agenda that ran contrary to the interest of their constituencies, reputation appears again as a plausible and appealing explanation.

The Stability Pact is not the only instance of a social norm constraining public behavior in recent European history. In the early 1990s, the obedience to the theoretically dubious requirement of maintaining exchange rate parities *vis-à-vis* the German mark had most of the features of a social norm. In fact some governments believed these parities to be crucial for their reputation. Adherence to that norm led to a strongly procyclical monetary policy, similar in many respects to the widely studied (e.g., Clarke 1967) British experience of the 1920s. As a result, Europe entered a period of slow growth and mounting unemployment that lasted almost six years.

In the next section we present a simple model derived from Akerlof (1980), in which we show that an inefficient equilibrium caused by a social norm can be sustained, if deviation from the norm causes a loss of reputation. The existence of a social norm may therefore result in a lower level of income for the area as a whole.

4. The Model

This section introduces a static, very stylized model of public choice and reputation. In general terms, the government's objective function has two arguments, welfare of the population, and reputation among its peers. This general setting may be applied to various problems; in this paper we assume that the welfare measure is the output gap,[11] whereas reputation stems from obeying the Stability Pact, and giving up income stabilization. Consistently with our previous discussion, we assume that positive and negative externalities linked to budget deficits wash out, so that they do not play a role in the model.

Suppose we have an economic union of mass 2 (the reason for this choice will be clear shortly below). Each country belonging to the union (indexed by i) is very broadly described by an aggregate demand relationship, and by a stochastic process describing private demand:

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[10]In a similar vein Fitoussi (2006) speaks of an 'hidden agenda' that the current European institutions help to push.

[11]By targeting the output gap, on one side the government reduces variability of income, therefore reducing uncertainty for its citizens; on the other, it sustains employment and per capita income, both linked to individual welfare.

$$y_i = c_i + g_i$$
$$c_i = y_n + \varepsilon_i. \tag{1}$$

Total income in country i is simply the sum of private (c_i) and public (g_i) expenditure, that for sake of simplicity can be viewed as deficit spending. The natural or potential level of income (y_n) is given by the deterministic part of private consumption, and it is assumed to be equal across countries. We assume that the shock has a uniform distribution with zero mean: $\varepsilon_i \sim U(-a, a)$.[12] Government expenditure g_i can be decomposed into a discretionary part, $g_{d,i}$ and automatic stabilization $g_{a,i}$, that is assumed to partially stabilize output ($\gamma < 1$):

$$g_i \equiv g_{a,i} + g_{d,i}$$
$$g_{a,i} = -\gamma \varepsilon_i. \tag{2}$$

The government objective is to set $g_{d,i}$ in order to minimize deviations from the natural rate of income (the output gap). We assume that it acts after the shock is realized. Suppose nevertheless that a social norm is in place, call it "Stability Pact." This norm stems from a political process, and has no clear economic justification; it considers values of g_i larger than a threshold $\bar{g}$, i.e., excessive deficits, as "bad." Each government knows that, by breaking the norm, it will gain the undesired reputation of a "naughty boy". The objective function is a loss minimization

$$\min_{g_{d,i}} \mathcal{L}_i = \alpha(y_i - y_n)^2 + R_i. \tag{3}$$

Notice that our formalization rules out any deficit bias, as governments do not try to push output above its natural level; this has the important implication that no conflict with the central bank arises, and we can avoid modelling monetary policy.[13] R_i is the loss linked to a bad reputation. We assume that the loss of reputation is proportional to the fraction of governments that believe in the norm, μ, and that it does not depend on the magnitude of g_i.

$$\begin{cases} R_i = 0 & \text{if } g_i \leq \bar{g} \\ R_i = \beta^2 \mu & \text{if } g_i > \bar{g}. \end{cases} \tag{4}$$

Obviously, for positive shocks the government faces no choice, and it stabilizes the economy. A government facing a negative shock faces a two step problem: (a) decide whether to break the norm and stabilize ($g_i > \bar{g} \Rightarrow R_i > 0$),

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[12]Given the assumption of mass 2, the density function is $f(x) = 1/a$. Notice that this assumption about the shocks rules out *ex ante* correlation between income in the countries.
[13]A deficit bias would simply shift towards a positive average deficit the equilibrium of the economy, thus leaving unaltered the logic of our argument. By ruling out deficit biases, we are not concerned by strong empirical results like those of Fatás and Mihov (2003).

which it will do if the shock is large enough; and (b) if the norm is broken, what level of $g_{d,i}$ to choose. The problem can be tackled backwards, remembering that if the code is broken the reputation loss is not linked to the size of stabilization. Substituting Equations (1) and (2) within Equation (3), we obtain

$$\min_{g_{d,i}} \alpha [g_{d,i} + (1 - \gamma)\varepsilon_i]^2 + R_i \tag{5}$$

whose solution is

$$g_{d,i} = -(1 - \gamma)\varepsilon_i \Rightarrow \begin{cases} g_i = -\varepsilon_i \\ y_i = y_n. \end{cases} \tag{6}$$

If the government chooses to use discretionary policy to complement automatic stabilization, income remains at its natural level.

On the other hand, if the government opts for obedience to the norm, total expenditure will be limited by the threshold $\bar{g}$, and $y_i - y_n = \bar{g} + \varepsilon_i$. This implies that regarding the choice of whether to stabilize, the loss in the two cases (S/F, stabilize/follow the norm) will be

$$\begin{cases} \mathcal{L}_i^S = R_i = \beta^2 \mu \\ \mathcal{L}_i^F = \alpha [\bar{g} + \varepsilon_i]^2. \end{cases} \tag{7}$$

The norm will be followed only if $\mathcal{L}_i^F < \mathcal{L}_i^S$, i.e., if

$$|\varepsilon_i| \leq \bar{\varepsilon} = \beta \sqrt{\frac{\mu}{\alpha}} + \bar{g}. \tag{8}$$

Thus, as intuitive, the threshold $\bar{\varepsilon}$, i.e., the shock governments will endure without intervening to stabilize, will be higher if the reputation loss β is high, and if the weight given to the output gap α is low. On the other hand, if the rule were made less stringent (larger $\bar{g}$), more governments would follow the norm (larger $\bar{\varepsilon}$).

For computational simplicity, and without any loss of generality, from now on we will assume that $\bar{g} = 0$, meaning that any deficit will be sanctioned by a reputation loss. Furthermore, when referring to the "union" or the "area", we will focus on the part of governments faced with negative shocks, that has unit mass, and a distribution of shocks $\varepsilon_i \sim U(-a, 0)$.

4.1. Short-Term Equilibrium

In the short term the fraction μ of believers in the norm is given. As the shock has a uniform distribution, the fraction of governments following the norm, i.e., those for which the absolute value of the shock is small enough, is

$$m = \frac{\beta}{a} \sqrt{\frac{\mu}{\alpha}}. \tag{9}$$

4.2. Long-Term Equilibria

In the long run, the number of believers in the norm changes according to their number with respect to the followers.

$$\dot{\mu} = \varphi(m - \mu) \quad \varphi > 0 \tag{10}$$

where φ is a positive multiplicative constant. Thus, if more governments believe in the norm than follow it, the number of believers will decrease; and if the opposite holds, the number will increase. The following proposition characterizes the long run, or steady-state equilibrium ($\dot{\mu} = 0$):

PROPOSITION 1: *Suppose that $\beta > 0$; then*

(a) *Two equilibria may exist, one in which nobody follows the rule, and one in which a positive fraction $0 < \mu^{**} \leq 1$ of governments follows the rule:*

$$\mu^* = 0$$
$$\mu^{**} = \min\left(1, \frac{\beta^2}{a^2\alpha}\right) \tag{11}$$

(b) *The equilibrium μ^* is unstable, whereas the equilibrium μ^{**} is globally stable*

Proof: See Appendix.

μ^* corresponds to the equilibrium without reputation (nobody believes in the norm, nobody follows it and nobody is sanctioned for that). The other equilibrium is characterized by a positive fraction of governments following the rule and hence not stabilizing.[14] μ^{**} is inversely related to the parameters α and a: both a higher weight given to stabilization, and a more unstable macroeconomic environment, make the rule less sustainable. In particular the role of the latter parameter may be worth investigation in further research. Notice that if the sanctions are weak enough ($0 < \beta^2 < a^2\alpha \Rightarrow \mu^{**} < 1$) there is coexistence, in steady state, of governments stabilizing and governments abiding by the rule. In the following we will assume to be in such a situation.

Substituting back in Equation (8), we obtain the long term value for the threshold:

$$\bar{\varepsilon} = \frac{\beta^2}{a\alpha}. \tag{12}$$

4.3. Aggregate Income and Welfare

At the $\mu^* = 0$ equilibrium all governments stabilize, and aggregate income is $Y^* = y_n$ (the countries hit by negative shocks have unit mass). Accordingly,

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[14]As we are only concerned by the welfare effects of the norm, and as μ^{**} is the only stable equilibrium, we don't deal with the emergence of the rule, nor with its robustness with respect to parameter changes.

aggregate loss is $\mathfrak{L}^* = 0$, as R_i is equal to zero for every i. The equilibrium with some countries following the rule will on the other hand be characterized by lower aggregate income and larger aggregate loss.

PROPOSITION 2:   *Suppose $\beta^2 \in (0, a^2\alpha)$; then*

(a)   *The μ^{**} equilibrium, with a positive number of followers of the norm, is characterized by a lower level of production than the μ^* equilibrium:*

$$Y^* = y_n > Y^{**} = y_n - \frac{\beta^4}{2a^3\alpha^2}. \tag{13}$$

(b)   *The μ^{**} equilibrium is inferior: $\mathfrak{L}^* = 0 < \mathfrak{L}^{**} = \frac{\mu^{**}\beta^2}{a}(a - \bar{\varepsilon}) + \frac{\alpha}{3a}\bar{\varepsilon}^3.$*

Proof: See Appendix

In this section, we proved in the general case that the emergence of a social norm whose violation involves a reputation loss may yield two equilibria, one in which the norm is neglected, and the other in which it is followed by a positive fraction of agents. The latter equilibrium is globally stable, and it involves both a lower aggregate welfare and a lower average income.

To keep the algebra of the model tractable, in the following we normalize the shock and the weight to $a = \alpha = 1$. As a consequence,

$$\mu^{**} = \bar{\varepsilon} = \beta^2$$
$$\mathfrak{L}^{**} = \beta^4\left(1 - \frac{2}{3}\beta^2\right) \quad Y^{**} = y_n - \frac{\beta^4}{2}. \tag{14}$$

From now on we will focus on the only stable equilibrium ($\mu = \mu^{**}$).

5. Enlarging the Club: New Members and Reputation

In this section we explore the effects of the norm in the case of an enlargement of the union. To do so, we introduce heterogeneity in a peculiar way: we assume that for exogenous reasons (for example past history) not all countries suffer from the same reputation loss in case they break the code. To keep things simple, they are divided in two groups, (b)ad and (g)ood, of mass ν and $1 - \nu$ respectively. We further assume that countries belonging to the two groups face the same shocks, have the same natural income, and the same weight for output stabilization. The only difference is that reputation loss is larger for "bad" countries ($\beta_g < \beta_b$). For each group we can compute the threshold and the fraction of followers (see Equations 8 and 9, remembering that here $a = \alpha = 1$):

$$\bar{\varepsilon}_j = m_j = \beta_j\sqrt{\mu} \quad j = b, g. \tag{15}$$

The total number of norm followers is then

$$m = v m_b + (1 - v) m_g = (v \beta_b + (1 - v) \beta_g) \sqrt{\mu} = \beta \sqrt{\mu} \qquad (16)$$

where we define $\beta \equiv v \beta_b + (1 - v) \beta_g$. The steady-state equation and its nonzero solution (Equations 10 and 11) are

$$(v \beta_b + (1 - v) \beta_g) \sqrt{\mu} - \mu = 0$$
$$\mu^{**} = (v \beta_b + (1 - v) \beta_g)^2 = \beta^2. \qquad (17)$$

Accordingly, the values for the thresholds are

$$\bar{\varepsilon}_j = \beta_j \beta = \beta_j (v \beta_b + (1 - v) \beta_g) \qquad j = b, g \qquad (18)$$

where $\beta_g < \beta_b \Rightarrow \bar{\varepsilon}_g < \bar{\varepsilon}_b$. Average income for the area can be written as

$$Y^{**} = \underbrace{\int_{y_n-1}^{y_n-\bar{\varepsilon}_b} y_n \, dy}_{A} + \underbrace{\int_{y_n-\bar{\varepsilon}_g}^{y_n} y \, dy}_{B} + \underbrace{\int_{y_n-\bar{\varepsilon}_b}^{y_n-\bar{\varepsilon}_g} (vy + (1-v) y_n) \, dy}_{C}. \qquad (19)$$

The integral A collects the countries that do stabilize, because (the absolute value of) the negative shock is above all the thresholds. B represents countries whose shock is so small that they do not stabilize whatever their group is. Finally, integral C represents the group of countries for which the behavior depends on the group. If they are bad (v of them), they do not stabilize, whereas if they are good, they will find it convenient to stabilize. Equation (19) yields

$$Y^{**} = y_n - \frac{1}{2} \left(v \bar{\varepsilon}_b^2 + (1-v) \bar{\varepsilon}_g^2 \right) \qquad (20)$$

that is the equivalent of Equation (13).

Notice that, as fewer countries will stabilize, average income in the "b" group will be lower than in the "g" group:

$$Y_b^{**} = y_n - \frac{1}{2} \bar{\varepsilon}_b^2 < y_n - \frac{1}{2} \bar{\varepsilon}_g^2 = Y_g^{**}. \qquad (21)$$

Hence, even assuming that the natural level of income is the same, the mere existence of the norm may generate income inequality.

Newly admitted members are usually closely scrutinized to verify whether they abide by the rules. The 12 countries that joined the European Union in 2004 and 2007 are no exception, and though not formally, their public finances will most probably be subject to stricter controls from the old member states. In fact, in May 2004 the European Commission issued early warnings for six of the ten new member states, namely Cyprus, the Czech Republic, Hungary, Malta, Poland, and Slovakia. Even more plausibly, the newcomers themselves will do whatever is within their capabilities to show the other participants of the club that they deserve to be part of it. In terms of our model, this means that the ratio of governments for which deviations from the norm

imply a higher reputation loss has increased with the enlargement. Assume that the reputation loss of good countries is a fraction of the reputation loss of bad countries, $\beta_g = x\beta_b$, $x \in (0, 1)$. The following proposition relates average income, and its variability, with the ratio of bad governments on the total.

PROPOSITION 3:   *Assume that $0 < \beta_g = x\beta_b < \beta_b < 1$. Then, as the ratio of bad governments v increases:*

    (a)   Average income for the area as a whole decreases.

    (b)   Income variability for the area as a whole, $V(Y)$, increases, for values of x sufficiently low: $x < \bar{x}(v)$.

    (c)   The threshold $\bar{x}(v)$ is increasing in v : $\bar{x}'(v) > 0$.

Proof: See Appendix

    Figure (3) shows the shape of the threshold as a function of v. If the difference between good and bad countries in terms of reputation loss is large enough ($x < 2/3$) then, income volatility will increase even if the number of bad members of the club is low. Similarly, if the number of bad countries is large enough ($v > 1/2$), then income volatility will increase even if the penalty is similar for the two groups. Only the combination of similar penalties (large x) and a large majority of good countries (low v) could yield a decreased variability of income; in such a case, the decreased income variability of good countries would more than compensate the increased income variability of the bad countries.
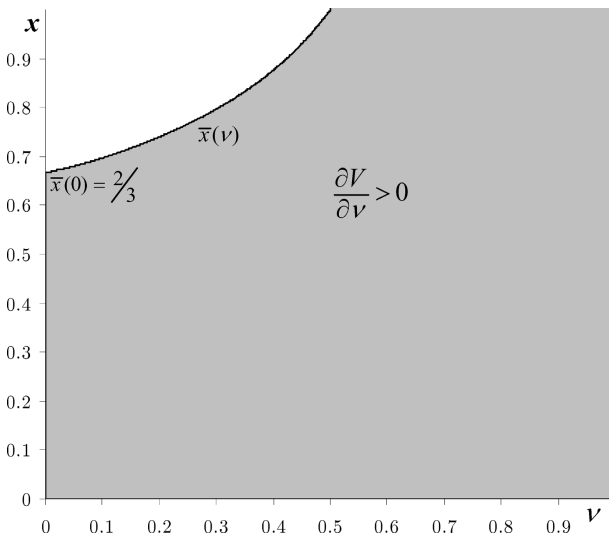

Figure 3: $\frac{\partial V}{\partial v}$ as a function of v and x.

Our model gives an insight on the possible effects of enlargement in presence of a constraining rule on stabilization policies. If the intuitive assumption that entrants will have to be more rigorous than the old members of the union proves correct, then the norm will become more binding, with the effect of generally increasing income variability, and reducing the average income and welfare of the area. We believe that such a risk should be taken into account when discussing the future institutional setup of the EMU, and especially when coming to the issue of "deepening *versus* enlarging" the union. Notice furthermore that this result is derived in the most unfavorable case, given that besides reputation countries are all alike; the negative effects of the norm would be even more evident if we had allowed for heterogeneity.

6. Conclusion: Enlargement and the Pact

This paper developed the consequences of a strong but plausible premise, namely that the Stability and Growth Pact has uncertain theoretical justifications, and that its *raison d'être* is mainly a reputation issue. In this sense it may be considered a social norm of the type discussed in the introduction. The model we presented was willingly kept abstract and simple, in particular assuming that the system, as described by Equation (1), was static; and more importantly that positive and negative externalities washed out. At the price of more cumbersome algebra, we could express the model in terms of growth rates, keeping the main conclusions unaltered:

(i)   In spite of its lack of economic justification, the norm generates a stable equilibrium with lower income and welfare. Furthermore, the higher the weight attached to reputation loss, the lower the equilibrium income level.

(ii) Further making the plausible assumption that, in case they broke the Pact, new members would suffer a higher loss in reputation than the others, we showed that the enlargement would further decrease the area wide average income level, and increase its dispersion. This conclusion seems to suggest that enlargement may help break the "bad" equilibrium and help the EU out of the suboptimal social norm.

A few extensions might add to the insights of model. Some would intuitively strengthen our results, for example if the model was complicated in order to keep track of long term variations in potential income. If we consider that, especially in periods of fast technological change, potential output is plausibly affected (via investment) by protracted periods of low growth, the dynamics would probably result in even stronger long run negative effects of a social norm depressing output in the short run. Another extension that would highlight the negative effects of the Pact is the consideration of common (instead of independent) shocks, and of interdependence between countries.

If business cycles are synchronized, then the number of countries breaking the code would be larger in recession times (something we are observing nowadays). The effect of this extension on the norm itself (could it be that if a common shock is severe enough the norm simply breaks down?) would be particularly interesting to study. On the other hand, the explicit consideration of negative externalities of budget deficits would soften our conclusion; showing how do externalities interact with the reputation issue tackled in this paper would certainly be interesting. Finally, in this paper we oevelooked an important source of heterogeneity in the European Union, the size of the economy. Small countries have had very different patterns: some of them, Austria, Finland, Luxembourg, have made fiscal discipline their trademark, while others, like Portugal, Greece and The Netherlands had problems conforming with the provisions of the Pact. On the other hand, the three large countries, regardless of their government and policies, struggled to remain within the fiscal constraints. Le Cacheux and Saraceno (2007) show with a simple model of monetary union that in small open economies the weight of domestic demand is less important, and as a consequence constraints to fiscal policy do not significantly affect aggregate demand and output. This implies that for these countries structural reforms are a preferred way to solve their problems, while fiscal policy is harder to give up for larger ones. In terms of our framework this would imply that small countries are able to acquire good reputation with a lower cost. Furthermore, this reputation is consistently used in negotiation venues, to counterbalance the economic power of large countries. This explain why smaller countries tend to oppose any attempt at reforming the Pact. Thus, the introduction of size heterogeneity in our framework would be expected to affect both the sanctioning scheme, and the influence of deficits on reputation.

Appendix A: Proof of Propositions

Proof: Proposition 1

(a) Equation (10), together with the steady-state condition $\dot{\mu} = 0$ implies $m = \mu$ (i.e., using Equation 9)

$$\mu = \frac{\beta}{a}\sqrt{\frac{\mu}{\alpha}} \tag{A1}$$

the two solutions are given in Equation (11), and repeated here for convenience:

$$\mu^* = 0$$

$$\mu^{**} = \min\left(1, \frac{\beta^2}{a^2\alpha}\right)$$

where the formulation for μ^{**} stems from the fact that $\mu \in [0, 1]$.

(b) For notational convenience, define $K = \frac{\beta}{a\sqrt{\alpha}}$, implying that $\mu^{**} = K^2$. In order to study stability, we substitute (9) inside (10), to obtain the following:

$$\dot{\mu} = F(\mu) = \varphi(K\sqrt{\mu} - \mu). \tag{A2}$$

Notice that $F(0) = F(\mu^{**}) = 0$. Furthermore, notice that

$$\lim_{\mu \to 0} F'(\mu) = \lim_{\mu \to 0} \frac{1}{2\sqrt{\mu}} - 1 > 0$$

so that the $\mu^* = 0$ equilibrium in unstable. Global stability of μ^{**} requires $F(\mu) > 0 \,\forall \mu < \mu^{**} = K^2$, and $F(\mu) < 0 \,\forall \mu > \mu^{**} = K^2$, exactly what we have (remember that $\varphi > 0$):

$$\begin{aligned} K\sqrt{\mu} - \mu > 0 &\Longleftrightarrow \mu < K^2 = \mu^{**} \\ K\sqrt{\mu} - \mu < 0 &\Longleftrightarrow \mu > K^2 = \mu^{**} \end{aligned} \tag{A3}$$

so that μ^{**} is globally stable. ∎

Proof: Proposition 2

(a) If $\varepsilon_i \sim U(-a, 0)$, it follows that $y_i = y_n + \varepsilon_i \sim U(y_n - a, y_n)$. Aggregate (and average) income of the area, when $\mu = \mu^{**}$, can then be written as

$$Y^{**} = \frac{1}{a} \left(\underbrace{\int_{y_n-a}^{y_n-\bar{\varepsilon}} y_n \, dy}_{A} + \underbrace{\int_{y_n-\bar{\varepsilon}}^{y_n} y \, dy}_{B} \right), \tag{A4}$$

where A denotes the "extreme" countries, whose shock is large, whereas B is the income of countries which do not stabilize, and consequently produce $y_i = y_n + \varepsilon_i$. Changing from y_i to ε_i, and collecting the y_n term, Equation (25) can be rewritten as

$$\begin{aligned} Y^{**} &= \frac{1}{a} \left(y_n \int_{-a}^{0} d\varepsilon + \int_{-\bar{\varepsilon}}^{0} \varepsilon \, d\varepsilon \right) \\ &= y_n - \frac{1}{2a}\bar{\varepsilon}^2 \\ &= y_n - \frac{\beta^4}{2a^3\alpha^2} < y_n. \end{aligned}$$

(b) Governments stabilizing will face a reputation loss of $\beta^2\mu$, Countries following the rule will suffer a loss of $\alpha\varepsilon_i^2$. Aggregate loss can be written as

$$\mathfrak{L}^{**} = \frac{1}{a} \left(\int_{-a}^{-\bar{\varepsilon}} \mu^{**}\beta^2 \, d\varepsilon + \int_{-\bar{\varepsilon}}^{0} \alpha\varepsilon^2 \, d\varepsilon \right) \tag{A5}$$

$$= \frac{\mu^{**}\beta^2}{a}(a - \bar{\varepsilon}) + \frac{\alpha}{3a}\bar{\varepsilon}^3 \tag{A6}$$

$$= \frac{\beta^4}{a^2\alpha}\left(1 - \frac{2}{3}\frac{\beta^2}{a^2\alpha}\right) > 0 \tag{A7}$$

given that $\beta^2 \in (0, a^2\alpha)$. Thus,

$$\mathfrak{L}^{**} > \mathfrak{L}^* = 0. \quad \blacksquare$$

Proof: Proposition 3

First of all notice that $\beta_b > \beta_g \Rightarrow \bar{\varepsilon}_b > \bar{\varepsilon}_g$, i.e., that the threshold value is different for countries belonging to the two groups

(a) Recall that average income is (from Equation 20)

$$Y^{**} = y_n - \frac{1}{2}\left(v\bar{\varepsilon}_b^2 + (1 - v)\bar{\varepsilon}_g^2\right) \tag{A8}$$

whose derivative is

$$\frac{\partial Y^{**}}{\partial v} = -\frac{1}{2}\left[\bar{\varepsilon}_b^2 - \bar{\varepsilon}_g^2 + 2vb\left(\bar{\varepsilon}_b\frac{\partial\bar{\varepsilon}_b}{\partial v} - \bar{\varepsilon}_g\frac{\partial\bar{\varepsilon}_g}{\partial v}\right)\right] < 0$$

given that $\frac{\partial\bar{\varepsilon}_b}{\partial v} = \frac{\partial\bar{\varepsilon}_b}{\partial\beta}\frac{\partial\beta}{\partial v} = \beta_b(\beta_b - \beta_g) > \frac{\partial\bar{\varepsilon}_g}{\partial v} = \beta_g(\beta_b - \beta_g)$ by the assumption $\beta_b - \beta_g > 0$, which guarantees that the term within square brackets is positive.

(b) The variance of income can be written, similarly to the mean, as

$$V(Y) = \int_{y_n-1}^{y_n-\bar{\varepsilon}_b}(y_n - Y^{**})^2\,dy + \int_{y_n-\bar{\varepsilon}_g}^{y_n}(y - Y^{**})^2\,dy$$

$$+ \int_{y_n-\bar{\varepsilon}_b}^{y_n-\bar{\varepsilon}_g}\left(vy + (1 - v)y_n - Y^{**}\right)^2\,dy. \tag{A9}$$

Tedious algebra, and substitution of Y^{**} with the value from Equation (20), yields

$$V(Y) = v^2\bar{\varepsilon}_b^3\left(\frac{1}{3} - \frac{1}{4}\bar{\varepsilon}_b\right) + (1 - v)^2\bar{\varepsilon}_g^3\left(\frac{1}{3} - \frac{1}{4}\bar{\varepsilon}_g\right)$$

$$+ 2v(1 - v)\bar{\varepsilon}_g^2\left(\frac{1}{3}\bar{\varepsilon}_g - \frac{1}{4}\bar{\varepsilon}_b^2\right). \tag{A10}$$

Given that $\beta_g = x\beta_b$, we can write $\beta \equiv (1 - v)\beta_g + v\beta_b = ((1 - v)x + v)\beta_b$. Remember that with $\alpha = a = 1$, we have $\bar{\varepsilon}_j = \beta\beta_j (j = b, g)$.

Furthermore, take the derivative with respect to v, divide throughout for β_b^6, and for notational ease, define $b = \beta_b^2$:

$$C = \frac{\partial V}{\partial v}\frac{1}{\beta_b^6} = -\frac{3}{2}(x+1)^2(x-1)^6 b v^5$$

$$+ 5\left(\frac{1}{2}x(x+1)(3x+2)(x-1)b + \frac{1}{3}(x^2+x+1)\right)(x-1)^4 v^4$$

$$+ 4\left(-\frac{1}{4}x(15x^2+20x+6)(x-1)b - (x^2+x+1)\right)(x-1)^3 x v^3$$

$$+ 3\left(x(5x^2+5x+1)(x-1)b + \frac{1}{3}(2x^2+4x+3)\right)(x-1)^2 x^2 v^2$$

$$+ 2\left(-\frac{1}{4}x(15x^2+1+10x)(x-1)b + \frac{1}{3}(2x^2-4x-1)\right)x^3(x-1)v$$

$$+ \left(\frac{1}{2}x(3x+1)b - 1\right)x^5(x-1).$$

We want to show that

$$\frac{\partial V}{\partial v} > 0 \qquad \forall x < \bar{x}.$$

We notice that if $b \to 0$, considering that $x, v \in (0, 1)$

$$C|_{b\to 0} = \frac{1}{3}(1-x)(2xv(1+x+x^2)+3x^3+5v^2(1-x^3))$$

$$\times (x(v-1)-v)^2 > 0,$$

and that the derivative of C with respect to b is negative:

$$\frac{\partial C}{\partial b} = -(1-x)(x^2(1-v)+v)(3x^2(v-1)-x-3v)$$

$$\times (x(v-1)-v)^3 < 0.$$

Thus, there will be a threshold level of b, such that $C = 0$:

$$C|_{b=\bar{b}} = 0 \Rightarrow$$

$$\bar{b} = \frac{2}{3}\frac{(5v^2(1-x^3)+2x^2v(1+x)+2xv+3x^3)}{(x^2(1-v)+v)(3x^2(1-v)+3v+x)(x(1-v)+v)}.$$

For values lower than the threshold we have that $C > 0$, so that when $\bar{b} \geq 1$, then the derivative of income variance with respect to v will be positive. Unfortunately this is not true for any pair $(v, x) \in (0, 1)$, and we need to define a threshold $\bar{x}$ for which the variance is positive, given the other parameters.

An explicit relationship between x and ν is impossible to find, but we can study the function at its extremes. When $\nu \to 0$, the threshold is

$$\bar{b}|_{\nu \to 0} = \frac{2}{3x^2 + x}$$

so that $x \leq \frac{2}{3} = \bar{x} \Rightarrow \bar{b} \geq 1$. In other words, whenever $x < \bar{x} = \frac{2}{3}$, the variance of income will be increasing in ν. If $x \to 1$, then we have

$$\bar{b}|_{x \to 1} = \frac{1}{2} + \nu,$$

so that $\bar{b} \geq 1 \Rightarrow \nu \geq \frac{1}{2} = \bar{\nu}$.

(c) In the $(\bar{x}, 1)$ and $(0, \bar{\nu})$ range we have to use numerical simulations to solve for the relationship between the threshold $\bar{x}$ and the proportion of bad countries ν.[15] The results of the simulation allow to draw Figure 3 in the text, that shows a positive relationship between x and ν. ∎

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[15]The matlab code is available at (web page reference delete for blind refereeing).

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