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Heinemann, Friedrich

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**The EMU Consolidation Game -
or: Does 3.0 Really Mean 3.0?**

Friedrich Heinemann

The EMU Consolidation Game - or: Does 3.0 Really Mean 3.0?

Friedrich Heinemann

Centre for European Economic Research (ZEW), Mannheim

January 1998

Abstract

Within the economic profession, it is a widely held view that the fiscal criteria of the Maastricht treaty are arbitrary numbers without economic foundation. Much of this criticism seems to overlook an important aspect - the strategic dimension of the criteria. This paper focuses on one particular question out of this broad strategic complex: How do the criteria change the fiscal bargaining situation on the national level? For this purpose, a bargaining game between a national finance minister and an interest group over budget consolidation is designed. The purpose of this paper is twofold: On the one hand the analysis should contribute to a better understanding of the strategic effects of the fiscal criteria in the pre-EMU period. On the other hand it is to provide insights helpful for the construction of credible and strategically consistent debt limits in the time after the introduction of the Euro.

JEL-Classification: C 78, D 72, F 33, H 60

Keywords: European Monetary Union, Convergence Criteria, Budget Consolidation, Boundary, Signalling, Conditionality

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Dr. Friedrich Heinemann
ZEW
P.O. Box 10 34 43
D-68034 Mannheim

Phone: +621-1235-149
Fax: +621-1235-223
E-mail: heinemann@zew.de

Nontechnical Summary:

Within the economic profession, it is a widely held view that the fiscal criteria of the Maastricht treaty are arbitrary numbers without economic foundation. Much of this criticism seems to overlook an important aspect - the strategic dimension of the criteria. This paper focuses on one particular question out of this broad strategic complex: How do the criteria change the fiscal bargaining situation on the national level? This focus is motivated by the observation that the convergence criteria in both applications - both as EMU entrance barrier and as an element of the Pact for Stability and Growth - have the function to change the outcome of budgetary bargaining on the national level.

At first, there is a short description of the role of so called "boundaries" in bargaining situations. The fiscal criteria can be interpreted in this context because they fulfil the defining characteristic of a boundary: In case that the counterplayer crosses a more or less arbitrarily set boundary this provokes massive sanctions. Apart from that, the fiscal criteria can also be interpreted as signals in fiscal games with asymmetric information.

After this introduction, a bargaining game between a national finance minister and an interest group over budget consolidation is designed. In this game, the finance minister uses the threat of an EMU postponement to force the interest group to support budget consolidation. Necessary and sufficient conditions for the credibility of this threat are derived under assumptions of both complete and incomplete information. A credibility indicator is constructed. Furthermore, statements concerning the possibility of an actual postponement are made.

The results of this specific consolidation game are helpful to clarify the conditions for the effectiveness of a certain type of conditionality in a more general way: If a government's opponents do not give up resistance to reforms, they are punished by a delay of economic integration. The above results hint on the necessary constellation for such conditionality to work: First, government's opponents must have an interest in integration. The benefit from integration for the interest group in question must be large enough to compensate for the losses that are associated with giving up resistance to reform. Second, a government using that kind of threat must be inherently credible. Credibility is seriously undermined if the government itself is heavily eager for integration. A further insight from the consolidation game is worth to be marked: There is nothing endogenous in this type of bargaining that would lead to a long postponement or even a complete failure of integration. Thus the hypothesis, that a delay of EMU leads to failure necessarily, is not grounded on the strategic aspects of the consolidation game and must be motivated differently.

Das Wichtigste in Kürze:

Die fiskalischen Kriterien, die sowohl der Entscheidung über den EWU-Teilnehmerkreis als auch dem Stabilitäts- und Wachstumspakt zugrunde liegen, haben in der wirtschaftswissenschaftlichen Analyse eine überwiegend kritische Bewertung erfahren. Ein zentraler Vorwurf besteht darin, daß es sich bei den Grenzwerten um willkürlich festgelegte Größen handelt, die wenig aussagefähig sind etwa im Hinblick auf die Frage der Tragfähigkeit von Staatsverschuldung.

Zum Teil scheint diese Kritik einen wichtigen Aspekt zu übersehen: die strategische Dimension der Kriterien. In diesem Beitrag soll dieser noch zu wenig beachtete Aspekt der Fiskalkriterien im Rahmen eines Verhandlungsmodells beleuchtet werden. Dieser Ansatz ist dadurch motiviert, daß die Fiskalkriterien in ihren beiden Anwendungen - EWU-Kandidatenkür und Stabilitäts- und Wachstumspakt - vor allem die Funktion haben, die Ergebnisse von Budgetverhandlungen in den EU-Staaten zu verändern. Die Verhandlungsmacht von um Einsparungen ringenden nationalen Finanzministern gegenüber sich widersetzenen Interessengruppen soll durch diese exogenen Vorgaben gestärkt werden.

Vor diesem Hintergrund wird zunächst dargestellt, welche Rolle sogenannte „boundaries“ in Verhandlungen spielen. Dabei handelt es sich wie bei den Fiskalkriterien um mehr oder minder willkürliche Grenzen, bei deren Überschreitung es zu massiven Sanktionen kommt. Des weiteren werden die Fiskalkriterien als „Signale“ in fiskalischen Auseinandersetzungen mit asymmetrischen Informationen interpretiert.

In der Modellierung werden dann die Verhandlungen zwischen einem Finanzminister und einer Interessengruppe dargestellt. Der Finanzminister macht Gebrauch von der Drohung einer EWU-Verschiebung für den Fall, daß die Interessengruppe sich einer Konsolidierung widersetzt. Unter verschiedenen Annahmen über die Informationsstruktur des Spiels wird gezeigt, welche notwendigen und hinreichenden Bedingungen erfüllt sein müssen, damit die Sanktionsdrohung des Finanzministers glaubwürdig sein kann. Glaubwürdigkeitsindikatoren werden abgeleitet.

Außerdem ergeben sich Aussagen über die Möglichkeit einer Verschiebung: Es zeigt sich, daß aus der Spielsituation heraus eine Verschiebung bei vollständiger Information über die Eigenschaften des Gegenspielers nicht möglich ist. Erst bei unvollständiger und asymmetrischer Information kann es zu einer strategisch motivierten Verschiebung kommen. Der Finanzminister erhält durch eine Verschiebung die Möglichkeit, die Interessengruppe von seiner tatsächlichen Entschlossenheit zu überzeugen.

"The clock for the Euro will not be stopped",

Helmut Kohl, German Chancellor, June 1997.

"3.0 means 3.0",

Theo Waigel, German Finance Minister, in early 1997.

1 Introduction

The fiscal criteria in both the EMU qualification process and the Pact for Stability and Growth are far from popular in the economic analysis. A widely held view is that the limits of 3 percent for the deficit-GDP-ratio and of 60 percent for the debt-GDP-ratio are arbitrary numbers without economic foundation. According to this view the criteria are neither a necessary nor a sufficient condition for the sustainability of a given debt position. Another line of criticism rejects the necessity of debt limits even of a refined kind. Given the independence of the European Central Bank and the prohibition of any central bank credit to European governments - both elements unequivocally stated in the Maastricht Treaty - financial markets can be expected to control fiscal policy. In this view the fiscal criteria restrict fiscal flexibility without economic justification and, consequently, are an unnecessary burden for the European economy.¹

Without elaborating these issues any further the idea of this paper is to shed more light on a neglected aspect - the strategic dimension. While strategic issues are very present in the political debate they do not seem to be adequately taken into account in the scientific analysis of the convergence criteria. This absence may have led to misunderstandings and to premature conclusions concerning the evaluation of the criteria. Taking into account the strategic dimension means to look how the fiscal criteria could modify the relative bargaining power of different players and thus change the equilibria in different bargaining situations. Aspects such as the credibility of the 3.0-commitment or the uncertainty about EMU's prospects after a postponement are at the heart of the political discussion. If the new equilibrium - after the introduction of these debt limits - is preferable to the situation before, this is

¹ Take for example the influential and very sceptical analysis of the fiscal criteria by Buiters, Corsetti and Roubini (1993).

an argument in favour of the criteria no matter how arbitrary the design of the criteria is. This already hints on the fact that some of the cited criticism might simply miss the point.

The Maastricht criteria have changed the environment in a way that is relevant to the outcome of numerous games being played in the real world: Until May 1998 the EU governments are playing a thrilling game on EMU membership. Financial markets and European governments are playing a game concerning the expectations on the stability of the Euro. On a constitutional level there is a game going on concerning the design of the optimum contract restricting European fiscal politicians in the proceeding integration process.

However, presumably the clearest example of the relevance of the fiscal criteria is the game that has been played in the last few years between national governments and interest groups over budget consolidation. The criteria have been the most cited argument in all EU countries in governments' attempts to carry through consolidating measures heavily opposed by interest groups. It is this consolidation game whose structure and equilibria will be analysed in detail in the subsequent sections. The purpose is not only the better understanding of the pre-EMU period but also to derive conclusions for effective debt limits after the introduction of the Euro.

The structure of the paper is as follows: In section 2 there is a short review on the function of clearly stated restrictions in games and negotiations. In section 3 the set-up of the consolidation game between the government and an interest group is described. In the succeeding section 4 the equilibrium outcome is derived assuming complete and symmetric information. In section 5 a credibility indicator is constructed. The consequences of asymmetric information - the interest group has no certainty about the determination of the government - are analysed in section 6. In the final section the results are summarised and conclusions are drawn.

2 The Fiscal Criteria as "Boundaries" and "Signals"

Flexibility can be bad. This is a central insight from bargaining theory. Committing oneself means strengthening one's bargaining position relative to the other party. In negotiations "being able to make commitments while your opponent cannot means that you have much of the bargaining power. This is, in Thomas Schelling's words, the paradox that the power to constrain an adversary depends upon the power to bind oneself " (McMillan, 1992, p. 54). These statements might seem paradox because commitment is reducing flexibility of action. Flexibility, however, is not beneficial during negotiations: "It is good to have a wide range of choice over what

position you are going to commit to. It is good to have flexibility before the negotiations begin, but to be inflexible during the negotiations" (McMillan, 1992, p. 54).

A finance minister trying to impose tough budgetary cuts against the resistance of well organised interest groups will have a better chance of success if his determination is beyond doubt. In this respect it becomes clear that an analysis of the fiscal criteria not taking into account strategic issues is incomplete and misleading. It seems to be one of the most important purposes of the convergence criteria to limit flexibility of agents in order to change the bargaining results of fiscal processes. A national finance minister whose determination had been far from credible in the past finds himself in a completely changed bargaining position vis-à-vis interest groups after the introduction of the criteria.

The fiscal criteria are a typical example of a "boundary" (Schelling, 1960). A boundary is a sharply and unequivocally defined trigger point for a painful counter-reaction. In military conflicts a boundary is usually defined geographically. One party preannounces that if the enemy crosses a certain border there will be a heavy dose of retaliation. This example makes clear that the simple and unequivocal definition of the Maastricht criteria is a defining characteristic of a boundary. The preannounced counter-reactions in the Maastricht context are the postponement of EMU and - in the context of the Pact for Stability and Growth - pecuniary fines. Interpreting the fiscal criteria as boundaries the reproach of arbitrariness is simply not relevant. Arbitrariness and a strong discontinuity of behaviour are absolutely normal characteristics of a boundary. Clearness and credibility are necessary elements of a boundary, not some kind of scientific foundation.

Another interpretation is helpful to illuminate the strategic meaning of the fiscal criteria - looking at these limits as "signals". Signalling games are characterised by asymmetric information. The sender has characteristics that are not observed directly by the receiver. The signal is a message sent out by the sender. The receiver of this message can draw conclusions over the hidden characteristics of the sender. One of the best known economic application of this concept is Spence's (1973) model on job market signalling. In this model, the signal is the level of education a worker acquires. This level contains information on the worker's productivity. Acquiring education is costly and these costs are lower for high productivity than for low productivity workers. It is important to note that in the basic job-market signalling game the signal education does not need to have any effect at all on productivity in order to perform the information function.

Fiscal criteria of the Maastricht treaty can easily be interpreted by the same kind of reasoning: The member countries of EMU are to be chosen. In order to safeguard the stability of the new currency, only countries shall be accepted that have fiscal institutions compatible with non-excessive deficits. These fiscal institutions cannot

be assessed directly due to the complexity of this issue.² Instead a signalling game is constructed. The signal is the fiscal performance of a country relative to the Maastricht criteria. Fulfilling the criteria is costly and these costs differ between "stable" and "instable" countries. For a stable country it should be easier to send out the signal "deficit below 3 percent" than for an instable country. In this signalling context it can be shown again that the arbitrariness reproach is not relevant: It is not important whether the criteria themselves are direct conditions for fiscal stability or not. What is important for the function of the fiscal signalling game, however, is merely that the criteria's design makes fulfillment easy for stable countries and difficult for instable countries.³

For the function of both a boundary and a signal credibility is essential. It is not sufficient that a finance minister preannounces sanctions in case a given target is not reached. This preannouncement must be supplemented by proofs of a clear commitment. A typical way to commit oneself is to make a threat binding through handing the sanctioning over to a third party. In this respect in the Maastricht Treaty a standard commitment device has been applied by making the fiscal limits an external constraint backed by European law. Not the national government alone has to decide on sanctions but the institutions of the EU according to the rules of the Treaty.

In spite of this commitment it is obvious that the credibility of the EMU exclusion threat is not perfect. First of all the debt and deficit limits have a wide margin of interpretation - due to the clauses surrounding the precise numbers. Secondly, the decision on EMU membership and pecuniary fines is not completely external because the same politicians fighting for consolidation domestically decide on sanctions within their responsibilities in the EU council. Thirdly, there are risks associated with the sanctions. If a country must not enter EMU or EMU is postponed altogether there could be reactions on financial markets risking the project altogether. Interest groups building rational expectations see that the EU council deciding on the sanctions later on will take into account these risks. If these risks are excessive the sanction threat is not credible. Stated in the game-theoretical terminology: In this case the strategy involving sanctions is not subgame-perfect.

² There is a fast growing literature on the dependence of fiscal performance on constitutional institutions, political variables and budgetary procedures, see Alesina and Perotti (1996) for an example.

³ The success of most of EU countries to reach at least the deficit criterion hints to the type of equilibrium in this signalling game: It is a pooling equilibrium where the signalling has not led to a separation of different groups of countries. Of course, there is also the following optimistic interpretation: Almost all EU states today have already fiscal institutions compatible with non-excessive deficits.

In the following model these considerations will be analysed in a more formal way. The purpose of this formalisation is to put more precision to concepts such as bargaining strength and credibility in the context of the criteria. The approach will be based on the interpretation of the criteria as a boundary in a bargaining context.⁴

3 The Consolidation Game

There are two players in the consolidation game: the finance minister (*FM*) and an interest group (*IG*). Both are bargaining over budget consolidation. *FM* can be seen as the personification of the fiscal authority of a country. While thus the influence of *FM* is not controversial the power of a single interest group concerning budgetary policy may raise questions. There are two interpretations behind this construction: Either this interest group can be regarded as the typical one in a country with numerous but homogenous interest groups, or this interest group is the interest group having the decisive median position within a field of many interest groups that are characterised by single-peaked preferences analogous to the standard median voter models (Mueller, 1989). In comparison to the complexity of real world's budgetary procedures this two player setting may appear simplistic. However, it is sufficient to work out the important features of the EMU game.

IG and *FM* are interacting in rent seeking activities: *FM* offers subsidies favouring *IG* and is paid by *IG* in form of votes mobilised by *IG*. These rent seeking activities, however, have consequences for the budget balance. The higher the level of subsidies the higher the deficit.⁵

Now *FM* tries to consolidate. Consolidation is only possible if *IG* accepts it. Against the opposition of the median or typical interest group, *FM* would not have the political support necessary to consolidate. "Consolidation" can stand either for simply bringing down the deficit temporarily or for changing the fiscal constitution in order to safeguard the consolidation permanently. In any case consolidation is costly for *IG*. A reduction of the deficit implies a reduced level of subsidies.

⁴ The signalling concept will not be evolved further in this paper. See Drudi and Prati (1993) for an interpretation of the fiscal criteria in the context of signalling debt sustainability.

⁵ This relation holds as long as both tax and deficit finance have increasing marginal political costs. Thus the financing for an increase in subsidies will be split between an increase in taxes and an increase in deficit. For this kind of reasoning, see for example Abrams and Dougan (1986).

Why should *IG* accept consolidation? Here EMU comes in. *FM* poses the following threat: Either *IG* accepts the consolidation that is compatible with a deficit of 3.0 percent or EMU will be postponed. "Postponement" can have two different meanings: It can either stand for the case in which EMU starts on schedule but the country in question misses qualification. Or it can stand for a postponement of the EMU project altogether. Because of the first interpretation, the postponement threat is not unrealistic a priori even if a postponement of EMU as a whole has never been possible.⁶ It might appear as a contradiction to the Maastricht Treaty that the national *FM* has the right to decide on the postponement issue since this lies in the realm of the European Council. This view is treated in section 4 as the special case of a fully credible commitment of *FM*. However, the resulting solution alone does not seem sufficient to solve the problem adequately since national representatives have an influence on the decision within their responsibilities in the European Council.

The bargaining game has the following sequential structure:

0: "Nature" draws the type of *FM*. In the complete information approach of section 4 the result is common knowledge: *IG* knows *FM*'s type. In the incomplete information extension of section 6, however, *IG* does not know the result but only the probability distribution of *FM*'s type.

A: *IG* has to move: Either he accepts or rejects consolidation. If he accepts, the game is over and consolidation has been achieved.

B: If *IG* rejects consolidation, *FM* has the next move. Either he gives in and EMU starts without consolidation or he sticks to his preannouncement and postpones EMU.

C: If EMU is postponed, "nature" moves and with a probability θ EMU fails permanently and the game is over without EMU and without consolidation. With the probability $(1 - \theta)$ the game will go on and after a delay of one period it restarts at A.

"Nature's" move in step C can be interpreted as the reaction of international financial markets to a postponement decision. If a postponement leads to massive turbulences on foreign exchange and bond markets this could mean EMU's failure for the foreseeable future.

⁶ It is an unresolved political and legal dispute whether a postponement of EMU altogether has ever been a real possibility.

Payoffs for all possible outcomes for both players are given in the following table with $\kappa, \lambda, \sigma, \tau \geq 0$.

TABLE 1 : PAYOFFS

	EMU and consolidation	EMU without consolidation	No EMU and no consolidation
<i>FM</i>	$\kappa + \lambda$	κ	0
<i>IG</i>	$\sigma - \tau$	σ	0

These payoffs have to be interpreted as present values of all future improvements/deterioration resulting from a change. With "no EMU and no consolidation" the initial situation remains unchanged, thus the payoffs are 0. The other outcomes imply changes. For *FM* the outcome "EMU with consolidation" is preferred over "EMU without consolidation", for *IG* vice versa. The present value interpretation can be illustrated for τ which measures the losses the *IG* has to endure with consolidation. This consolidation may comprise permanent structural changes in the fiscal institutions, resulting in a permanent reduction of subsidies - for example through the Pact for Stability and Growth. τ is the present value of all of *IG*'s future losses through cuts in subsidies resulting from consolidation. σ , on the other hand, is the present value of all gains resulting from EMU for *IG*. These gains may result for example from growth effects or savings in transactions costs due to the introduction of a European currency.

For *FM*, κ represents his EMU benefits. These benefits might both comprise economic and political elements. Part of the economic benefits are growth effects or - from the point of view of a former high inflation country - advantages stemming from the introduction of a stable currency regime. Political benefits are present if EMU is part of the general political programme of the incumbent government. λ stands for the benefits *FM* can realise in case of a successful consolidation. It can be left open whether in this model *FM* is a benevolent agent whose utility function is identical with society's welfare function or whether he is a politician maximising some kind of individual objective function. Important, however, is the assumption that *FM* is benefiting from consolidation. In the situation of critical levels of open and off-budget debt this is plausible both for a benevolent agent and a politician maximising his individual utility.

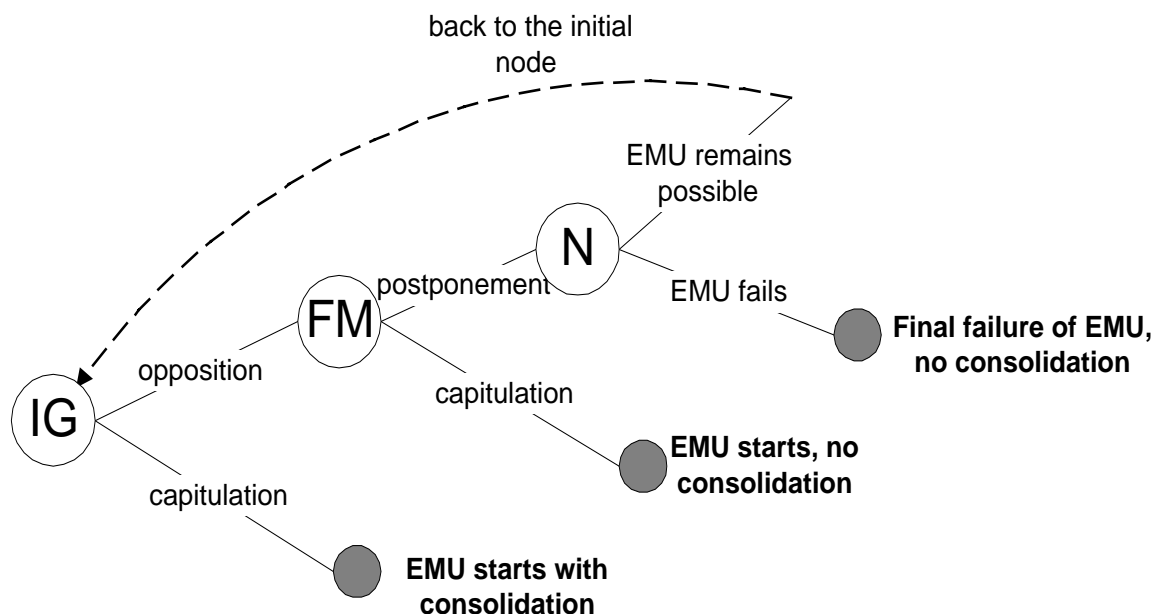
If these payoffs are not realised in the initial period they have to be discounted, evaluating them from the point of view of the initial period. The discount factors are $\delta_i = \frac{(1-\theta)}{(1+\rho_i)}$ with $i = FM, IG$ and ρ_i the rate of time preference. θ is the above mentioned probability of EMU's final failure after a postponement resulting, for

example, from capital market reactions to such a decision. Due to this definition $0 \leq \delta_i \leq 1$.

The structure of this sequential bargaining game is similar to the "war of attrition" by Alesina and Drazen (1991). Each player would benefit from the other giving up and thus ending the game. Due to discounting, any delay of the game's end is costly for both sides but these costs could be compensated for by reaching the preferred outcome.

In the following diagram the extensive form of the consolidation game is presented.

FIGURE 1: CONSOLIDATION GAME: THE GAME TREE UNDER COMPLETE INFORMATION



4 No EMU Postponement under Complete Information

In this section the game is played under the assumption of complete information: *FM*'s type is known to *IG*. The starting point of the analysis is the commitment solution. If *FM* could commit himself beyond doubt on his postponement threat then the outcome of the consolidation game is easily derived. This case would be given if the European Council's determination to base its EMU membership decision on a strict interpretation of the criteria would be fully credible. In this case the national *FM* could hint to an undeniable external constraint.

In this case *IG* has the choice to get either 0 (no EMU and no consolidation) or $\sigma - \tau$ (EMU and consolidation). *IG* will decide in favour of (against) EMU whenever $\sigma - \tau > 0$ (< 0). If for *IG* EMU's advantages would not at least balance the costs of consolidation, then even under perfect commitment *FM* has no chance to win the game. Under these circumstances a postponement of EMU simply is no threat to *IG*.

Proposition 1: *A necessary (not a sufficient) condition for the success of the EMU postponement threat in budgetary bargaining is that the opponents of consolidation remain EMU winners even if EMU is combined with consolidation ($\sigma - \tau > 0$).*

Some anecdotal illustration: It is not surprising that the German government failed to succeed in substantially cutting back subsidies for coal mining in its attempt to fulfil the deficit criterion. German coal mining is heavily protected from international competition and therefore this industry would not expect substantial advantages from EMU. However, the EMU postponement threat is a potential weapon dealing with lobbies such as export oriented industries that are clear Euro-winners.

Proposition 1 shows also that *FM*'s credibility can be undermined by increasing *IG*'s consolidation costs. An example: The Pact for Stability and Growth has been designed to transform the fiscal criteria from a temporarily effective limitation into a permanently binding one. A temporary cut of subsidies limited to the EMU qualification years is transformed into a cut of subsidies of a permanent nature. This institutional change could mean for some interest groups a dramatic increase of consolidation costs changing the payoff of the EMU-consolidation-outcome from the positive into the negative area. In this case the postponement of EMU ceases to be a threat to this interest group. Thus, intensifying consolidation pressure can erode the bargaining power of *FM*.

Turning now to the case where there is no exogenous commitment, a necessary (but not sufficient) condition for the credibility of the postponement threat can be derived. *FM* could only be credible at least for one round of the game if the best possible outcome of a postponement is better for *FM* than an immediate capitulation. In order to avoid an immediate collapse of *FM*'s credibility, the following relation must hold: $\delta_{FM} > 1 / (1 + \lambda/\kappa)$. This condition ensures that from *FM*'s point of view the EMU-consolidation-outcome after a postponement of one period is better than EMU immediately without consolidation. This is not a sufficient condition for credibility because it is not clear whether after a postponement *FM* can carry through consolidation immediately.

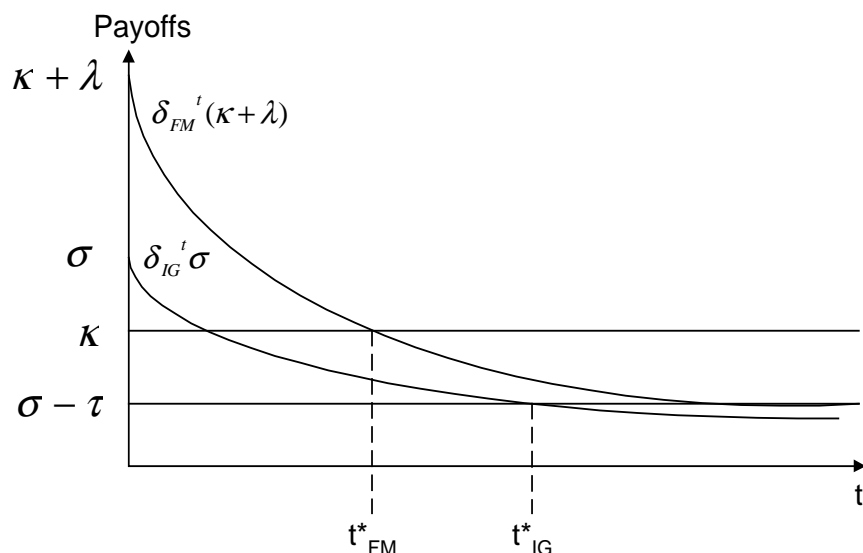
Proposition 2: *FM*'s credibility is endangered by a large time preference (ρ_{FM}), an increasing probability of EMU's final failure after a postponement (θ) and a large payoff from EMU relative to the payoff from consolidation (κ/λ). A necessary (not a sufficient) condition for the credibility of *FM*'s postponement threat is $\delta_{FM} > 1 / (1 + \lambda/\kappa)$.

This result also has important real world implications. In the run up to the EMU membership decision many politicians have assured that any postponement would imply a failure of EMU altogether. Translated into the model this means that θ is approaching unity and δ zero. If this is the case, *FM*'s threat has no credibility at all. Thus any attempt to use the EMU-postponement threat for consolidation is senseless if there is the general belief that a postponement of EMU leads to a failure with certainty. Note that δ is zero for both *FM* and *IG* in this case but that this nevertheless puts *FM* into the weaker position. *FM* has the second mover disadvantage: *FM* has to decide over EMU postponement after *IG* has opted to resist consolidation. Because with δ_{FM} equal zero *IG* knows that *FM* will not postpone, *IG* does not risk anything by opposing consolidation. Apart from this there is the standard argument for a specifically lower discount factor of *FM* compared to *IG* factor: Politicians tend to discount the future heavily facing the next election with an uncertain outcome.

So far only necessary conditions for *FM*'s credibility have been stated. The derivation of a sufficient condition for *FM*'s credibility amounts to the search for the equilibrium of this game. The solution can be found by looking for the maximum number of periods (t^*) each side would be willing to wait in order to end up with the preferred outcome and to avoid immediate capitulation. This calculus is described in Figure 1. t^* is defined to be the number of periods for which a player

due to discounting is indifferent between immediately giving up and accepting the unfavourable outcome or enduring delay and getting the preferred outcome.

FIGURE 2: WHO COULD HOLD OUT LONGER? THE DERIVATION OF t^*



According to this calculus the maximum possible length of delay each player could hold out is given by the following equations:

$$(1) \quad t^*_{FM} = \ln\left(\frac{K}{K + \lambda}\right) / \ln \delta_{FM}$$

$$(2) \quad t^*_{IG} = \ln\left(\frac{\sigma - \tau}{\sigma}\right) / \ln \delta_{IG}$$

FM's threat will be only credible if he could stand longer than *IG* the discounting costs of an EMU delay. For both sides any strategy implying to hold out longer than t^*_i would not be internally consistent because an immediate capitulation would be preferable.

In deciding who is the winner in the consolidation game the sequential structure of the game has to be taken into account. Whenever *IG* decides to be tough he can speculate that *FM* will give up in the same period. Whenever *FM* decides to be tough he knows for sure that there will be at least a further delay of one period

before the preferred result could possibly be realised. Therefore *FM* will win the game only if the following relation holds:⁷

$$(3) \quad t^*_{FM} > t^*_{IG} + 1$$

Proposition 3: *A sufficient condition for the credibility of FM's postponement threat is that FM could hold out longer than IG until the discounting costs of a delay make a capitulation in the first period preferable (relation (3) must be fulfilled).*

Proposition 3 comprises propositions 1 and 2. However, it additionally relates *FM*'s to *IG*'s characteristics.

It is an important feature of this setting that due to complete information a postponement of EMU might be used as a threat but will never occur. Since both sides know exactly the opponent's characteristics and his t^* relative to the own, they see from the beginning who will be able to stay out longer. If one side knows initially to be the loser in the end, it will prefer giving up immediately due to the discounting costs of any delay. Thus any equilibrium where the weaker side's strategy would involve provoking a postponement and capitulating in a later stage would not constitute a Nash equilibrium.⁸ Either the credible postponement threat will make the *IG* to accept consolidation immediately or *IG* will resist an incredible threat and *FM* will give in.

Proposition 4: *Under complete information it will not come to a postponement of EMU. The weaker side will give up in the initial period in order to avoid the discounting costs that reduce EMU's benefits.*

⁷ It is abstracted from the problem of non-integer outcomes. Taking account of this would not be efficient: more formal complexity would not be accompanied by more insights.

⁸ This is a standard result of this war of attrition type of model under complete information. See Alesina and Drazen (1991, p. 1180).

5 An Indicator of Bargaining Strength

So far only pure strategies have been considered and this restriction will continue also in the incomplete information case of the next section. Here a mixed strategy equilibrium will be calculated with the limited purpose to derive an indicator of inherent bargaining strength. For game theorists this might appear to be an unconventional interpretation of a mixed strategy equilibrium. It is, however, a helpful way to illustrate how the relative bargaining strength of both parties depends on payoffs and discount factors.

A mixed strategy implies that in a given situation players will decide in favour of one among different actions at random and with a given probability. In the consolidation game the following assumptions are made: Whenever *IG* is to act he will fight consolidation with a probability of ψ and he will give in with probability $(1-\psi)$. Whenever it is up to *FM* to react, he will decide in favour of (against postponement) with a probability of φ ($1-\varphi$, respectively).

It is in the nature of such a mixed equilibrium setting that both sides must be indifferent between their available choices whenever they are to move (Rasmusen, 1994, 67-91). Otherwise a mixed strategy can not be the best available strategy. This indifference postulate allows to derive the mixed strategy equilibrium (see appendix for details):

$$(4) \quad \psi^* = \frac{\kappa}{\lambda} \left(1 - \frac{1}{\delta_{FM}}\right) + 1 \quad \text{with} \quad \frac{\partial \psi^*}{\partial \delta_{FM}} > 0, \frac{\partial \psi^*}{\partial (\kappa/\lambda)} < 0$$

$$(5) \quad \varphi^* = \frac{1}{\frac{\sigma}{\tau} - \delta_{IG} \left(\frac{\sigma - \tau}{\tau}\right)} \quad \text{with} \quad \frac{\partial \varphi^*}{\partial \delta_{IG}} > 0, \frac{\partial \varphi^*}{\partial (\sigma/\tau)} < 0$$

A mixed strategy equilibrium is only viable if both sides base their decisions on exactly these probabilities concerning the opponent's toughness. Any deviation from these probabilities would not support a mixed equilibrium any longer because the indifference postulate would be hurt.

These equilibrium supporting probabilities of the opponent can be interpreted as indicators concerning the strength of the own position. The higher ψ^* - the equilibrium supporting probability of *IG* to be tough - the stronger *FM*'s position.

The higher φ^* - the equilibrium supporting probability of *FM* to be tough - the stronger *IG*'s position.

If ψ were only a bit smaller than ψ^* then *FM* would clearly opt for toughness. To put it differently: If *FM* has inherent characteristics putting him into a strong position there needs to be a high probability of *IG* to be tough in order to make *FM* indifferent between a tough and a soft stance. The equivalent statement holds for φ and the characteristics of *IG*. This reasoning explains the seeming paradox that an increasing equilibrium probability of the opponent's toughness serves as an indicator of increasing own strength.

There is nothing in equations (4) and (5) restricting φ^* and ψ^* to be in the range between 0 and 1 and thus to be consistent with the probability interpretation. A result out of this range and thus inconsistent with the probability interpretation means that the indifference postulate can not be fulfilled - there is no admissible solution. Even this outcome, however, can be interpreted in terms of credibility: A value of ψ^* below 0 (above 1) indicates the absolute inferiority (superiority) of *FM*. The equivalent statement holds for φ^* and *IG*'s credibility.

With this background the above comparative static results of the mixed strategy equilibrium can be interpreted easily. For both players heavy discounting - a small individual δ - weakens the own position. For *FM* a high EMU payoff relative to the benefits from consolidation is a burden for credibility. The same holds for *IG* and a high EMU payoff relative to the costs of consolidation.

6 Incomplete information and EMU postponement

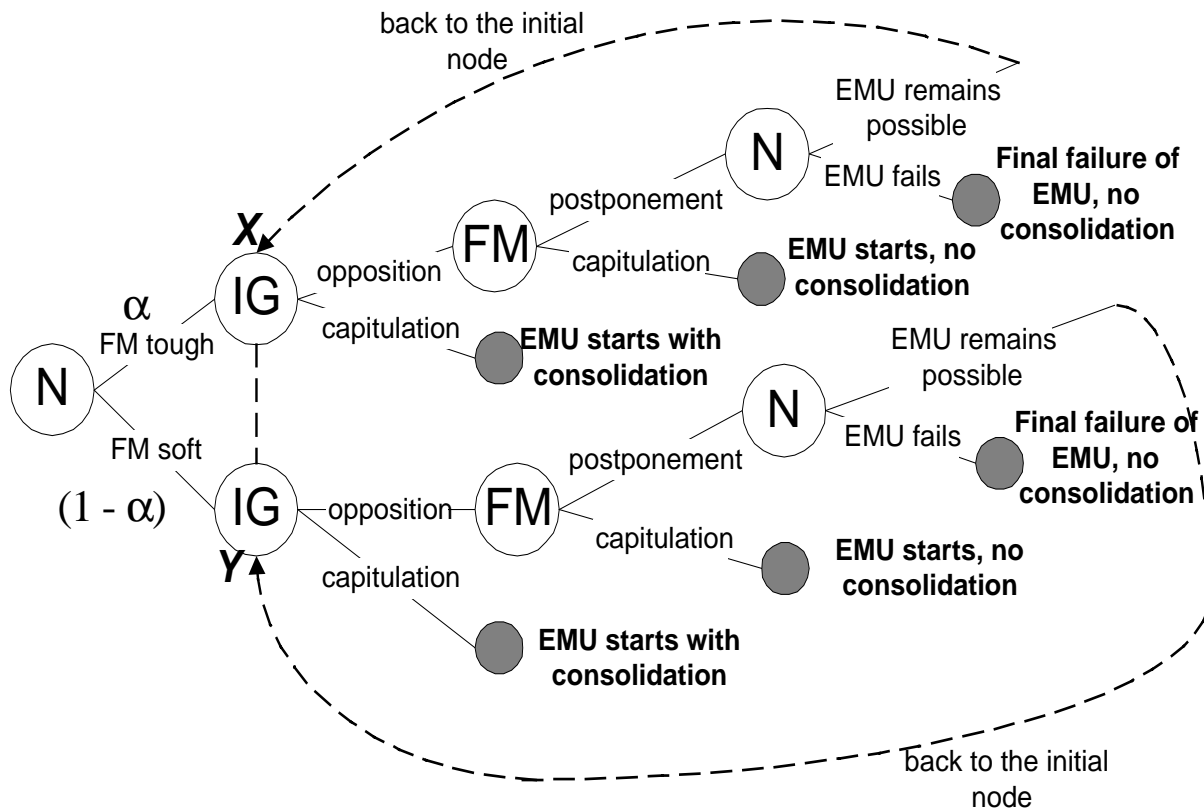
Up to now it has been assumed that both sides know each other's characteristics with certainty. This not very realistic assumption is modified in this section. Due to the complexity of the political process in regard to any EMU postponement decision it seems appropriate to attach an information disadvantage to *IG* in the consolidation game in the following sense: *IG* is uncertain about *FM*'s payoff resulting from consolidation, λ . *IG* does not know with certainty the opponent's degree of inherent determination. The higher λ the stronger *FM*'s bargaining position. *IG* knows the probability distribution of λ but not the actual value. Contrary to *IG*, *FM* has full information on both his own and the opponent's characteristics.

The probability density of λ is given by the following simple function:

$$(6) \quad f(\lambda) = \begin{cases} \alpha & \text{für } \lambda = \lambda^T \\ (1 - \alpha) & \text{für } \lambda = \lambda^S \end{cases} \quad \text{with } \lambda^T > \lambda^S$$

Thus λ^T stands for a ‘tough’ and λ^S for a ‘soft’ *FM*. The modified game tree is depicted in the following diagram. Initially ‘nature moves’ and chooses a type of *FM* (step 0 in section 3). The result of this move is not known to *IG*. When *IG* has to decide the first time between opposition and capitulation he does not know whether he is acting at node *X* or *Y*. In the game theoretical terminology: Both nodes belong to the same information set. In the course of the bargaining *IG* can possibly draw conclusions from the behaviour of *FM* and adjust his prior belief concerning *FM*’s characteristics.

FIGURE 3: CONSOLIDATION GAME: THE GAME TREE UNDER INCOMPLETE INFORMATION



Again, as in the complete information setting, both sides’ maximum tolerable EMU delay - t^* - is the clue to the solution. However, different to the complete information setting, t^*_{FM} is *FM*’s private knowledge. Even if *FM* is of the tough type he can not credibly communicate this to *IG* because a soft *FM* would have an incentive to lie and send out the same message of toughness. Thus only *FM*’s behaviour can possibly enable *IG* to draw conclusions. In the beginning of the bargaining game *IG*’s prior belief E_0 is the following:

$$(7) E_0(t^*_{FM}) = t^*_{FM}(E_0(\lambda)) = t^*_{FM}(\alpha\lambda^T + (1-\alpha)\lambda^S)$$

Depending on the value of $E_0(t^*_{FM})$ - which through equations (1) and (7) in turn depends on the general knowledge values of λ^T , λ^S - and depending on t^*_{IG} - given by equation (2) - the following constellations are possible:

Case A: Absolute strategic superiority of FM

$$(8) \quad t^*_{IG} + 1 < t^*_{FM}(\lambda^S) < t^*_{FM}(\lambda^T)$$

In this case IG will not try to oppose consolidation because he knows to be in the weaker position even if the opponent is of the soft type. EMU starts immediately and consolidation is carried through.

Case B: Absolute strategic inferiority of FM

$$(9) \quad t^*_{IG} + 1 > t^*_{FM}(\lambda^T) > t^*_{FM}(\lambda^S)$$

In this case IG will oppose consolidation successfully because independent of FM 's type IG can stand any conflict longer than FM and both sides are aware of this. As in case A there will be no postponement.

Case C: Potentially separating constellation

$$(10) \quad t^*_{FM}(\lambda^T) > t^*_{IG} + 1 > t^*_{FM}(\lambda^S)$$

With this constellation a tough *FM* will be in a superior and a soft *FM* in an inferior strategic position. While both preceding cases lead to a pooling equilibrium in the sense that both types of *FM* will act identically, case *C* is potentially separating. The restriction "potentially" is necessary because *FM* will only be forced to reveal his true type if *IG* actually opposes consolidation. If *IG* opposes consolidation the soft *FM* will give in and the tough *FM* will postpone EMU. A risk-neutral *IG* will provoke this self-revelation only if

$$(11) \quad t^*_{IG} + I > E_0(t^*_{FM})$$

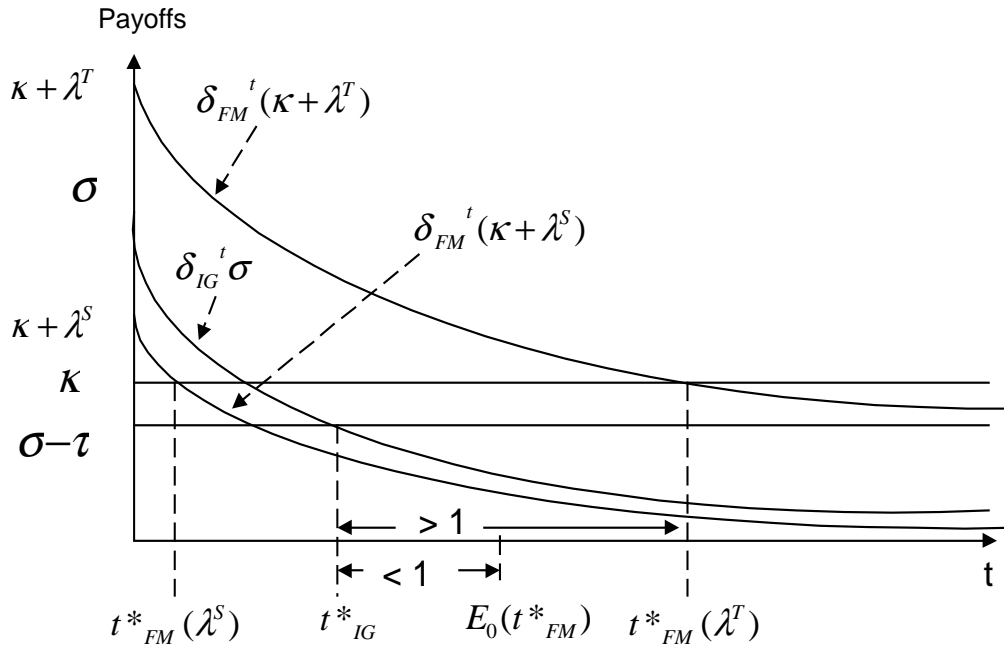
Thus, case *C* has to be differentiated further into two subcases: case *C.1*, where relation (11) holds, and case *C.2*, where it does not.

In *C.1* it comes to the outcome that *IG* will not oppose consolidation being aware that he would be able to win the game against a soft *FM*. This stems from the fact that *IG* expects to be weaker and that *IG* loses if he provokes a strong *FM*: He incurs the discounting costs of a postponement without a chance to avoid consolidation. Thus *IG* will avoid conflict if the probability of *FM* to be tough is large - even if *IG* would win against a soft *FM*.

Under the constellation *C.2* (depicted in Figure 4) *IG* will risk conflict because - based on his prior belief - he expects to be stronger than *FM*. After this move, *FM* will reveal his true type through a postponement (tough *FM*) or capitulation (soft *FM*). After *FM*'s move *IG* will correct his belief according to *FM*'s self-revelation and the game is over: Facing a strong *FM* with certainty, *IG* has no incentive to oppose any longer. With a soft *FM* the game is finished by *FM* himself through his capitulation.⁹

⁹ The maximum possible delay of one period seems to be in contradiction to similar sequential bargaining models such as Sobel/Takahashi (1983) where longer delays are possible. The explaining difference between the models is that in Sobel/Takahashi a longer delay can be beneficial for one side through a relation between delay and payoff-structure. This is different here, where the decision concerning EMU and consolidation is all or nothing and the payoffs are - apart from discounting - not influenced by the length of delay.

FIGURE 4: THE SEPARATING CONSTELLATION OF CASE C.2



These results can be summarised in the following way:

Proposition 5: *If there is incomplete information in the sense that FM's characteristics are no common knowledge a postponement is possible. The postponement allows FM to demonstrate his inherent bargaining strength to be higher than IG had expected a priori.*

Proposition 6: *In the incomplete information setting of the consolidation game, in spite of the infinite bargaining horizon, there can not be more than one postponement.*

7 Conclusion and Outlook

The results of this specific consolidation game are helpful to clarify the conditions for the effectiveness of a certain type of conditionality in a more general way: If a government's opponents do not give up resistance to reforms, they are punished by a delay of economic integration. The above results hint on the necessary constellation for such conditionality to work: First, government's opponents must have an interest in integration. The benefit from integration for the interest group in question must be large enough to compensate for the losses that are associated with giving up resistance to reform.

Second, a government using that kind of conditionality must be inherently credible. Credibility is seriously undermined if the government itself is heavily eager for integration. That is why - in the EMU context - it is inconsistent to convey the two messages of the following type (as it has been the case for example in Germany before the EMU qualification): "There will be a strict interpretation of the criteria: 3.0 equals 3.0" and "a postponement of EMU will have very negative consequences for the European economies". These two statements are not consistent and an interest group with rational expectations will recognise this. Thus, every government thinking about using this conditionality should on the one hand be clear about this precondition for credibility. On the other hand it should try to convey a consistent picture. A statement like "3.0 equals 3.0" must be paralleled by the statement "a postponement of EMU will only have minor negative consequences" - otherwise this kind of conditionality is senseless. In the end the government will lose its face.

A further insight from the consolidation game is worth to be marked: There is nothing endogenous in this type of bargaining that would lead to a long postponement or even a complete failure of integration. Under complete information there can not be any delay and the maximum possible delay under incomplete information is one period. This one period delay helps the government to prove its strategic superiority. Thus the hypothesis, that a delay of integration leads to failure necessarily, is not grounded on the strategic aspects of the consolidation game and must be motivated differently.

A standard proposition in the context of fiscal restrictions is that capital markets discipline budgetary policy. This general proposition does not hold in the specific context of this type of conditionality. If there is a high probability of EMU's final failure in case of delay resulting from capital market effects, then a government's credibility is destroyed and this conditionality will not work. Of course, these capital market effects are not analysed at all in the above model and it is an open question whether a delay will produce final failure with a high probability.

This model hints on relations that are open to empirical testing. EU countries facing the EMU qualification process have been in different positions concerning the credibility of the postponement threat. Since EMU has never been realistic without Germany and France and possibly some other core countries, "postponement" for these countries would imply postponing EMU altogether. For the peripheral countries, however, "postponement" would simply stand for exclusion from a punctually starting core EMU. It is plausible to assume that the latter kind of threat has always been more credible than the former. It could be tested whether the consolidation performance of the qualification period shows a corresponding pattern, i.e. larger consolidation progress in the periphery than in the core countries. A further consequence of the above model open for empirical testing concerns the structure of consolidation measures. The model shows that the postponement threat

should be more effective facing EMU winners - for example export oriented industries - and is ineffective dealing with EMU losers.

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Appendix: Derivation of mixed strategy equilibrium

The indifference postulate implies that from the point of view of each side the expected payoff from being soft must equal the expected payoff from being tough. Since the payoff in case of capitulation is certain, probabilities are only relevant in case of toughness. The following relations, where E is the expectation operator, must hold in a mixed strategy equilibrium:

$$\text{For IG: } \sigma - \tau = (1 - \varphi)\sigma + \varphi\delta_{IG} E(\text{payoff in case of FM's opposition})$$

$$\text{For FM: } \kappa = \delta_{FM}((1 - \psi)(\kappa + \lambda) + \psi E(\text{payoff in case of IG's continuing opposition}))$$

Because of the infinite structure of the bargaining situation, the last terms in both equations seem complex. However, due to the indifference postulate also in the next period both parties would be neutral between giving up at once and further resistance. Thus both equations can be simplified to:

$$\text{For IG: } \sigma - \tau = (1 - \varphi)\sigma + \varphi\delta_{IG} (\sigma - \tau)$$

$$\text{For FM: } \kappa = \delta_{FM}((1 - \psi)(\kappa + \lambda) + \psi \kappa)$$

Solving these equations to φ and ψ leads to equations (4) and (5) in the text.

Comparative statics:

$$\frac{\partial \psi^*}{\partial \delta_{FM}} = \frac{\kappa}{\lambda \delta_{FM}^2} > 0$$

$$\frac{\partial \psi^*}{\partial (\kappa/\lambda)} = (1 - 1/\delta_{FM}) < 0$$

$$\frac{\partial \varphi^*}{\partial \delta_{IG}} = \frac{\frac{\sigma - \tau}{\tau}}{(\sigma/\tau - \delta_{IG}(\frac{\sigma - \tau}{\tau}))^2} > 0 \quad (\text{for } \sigma - \tau > 0)$$

$$\frac{\partial \varphi^*}{\partial (\sigma/\tau)} = \frac{-(1 - \delta_{IG})}{(\sigma/\tau - \delta_{IG}(\frac{\sigma - \tau}{\tau}))^2} < 0$$