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The Better Route to Global Tax Coordination: Gradualism or Multilateralism?

Abstract

In the context of international tax coordination incomplete information is one of the well-known frictions that can lead to bargaining failure and might explain a lack of observed coordination. We consider international negotiations about tax coordination under complete and incomplete information. We identify the conditions for multilateral negotiations to be more likely to be successful than gradual/sequential negotiation approaches and compare different routes of sequential bargaining. Under plausible conditions, full-scale global coordination is least likely to emerge if the negotiations take place sequentially, and if the negotiations with the most unpredictable country take place last.

JEL-Codes: H250, H770, F520, F550.

Keywords: tax competition, tax cooperation, multilateral negotiations, sequential negotiations, ultimatum bargaining, acceptance uncertainty.

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1 Introduction

To solve transnational issues of taxation, organizations such as the OECD or the G20 often advocate multilateral solutions.[1] In contrast to this view, policymakers and their scientific advisors appeal to gradual approaches. One example is the discussion in France and Germany regarding a coalition of a subgroup of countries that are ready to act jointly.[2] The hope among gradualists is that a first gradual step will unleash further dynamics towards global cooperation. Blum (2008), who diligently assesses bilateral treaties (BLTs) in comparison to multilateral treaties (MLTs), articulates this hope. She suggests the following: "In time, the accumulation of such BLTs could generate a customary norm or spark the negotiation of a multilateral treaty. Successful bilateral formulas could serve as useful precedents and foundations for future MLTs." (Blum, 2008, p. 376).

We address these diverging views in an analytical framework. Suppose the international community likes to address the problems of base erosion and profit shifting. The final goal is a global solution for problems of international tax coordination. Should one go for a multilateral agreement and wait until such an arrangement is reached? Or does it make sense to start

[1] In Chapter 2 of the Action Plan on Base Erosion and Profit Shifting (2013, p.10) the OECD expressed its concerns regarding possible unilateral actions of some countries and advocated"a bold move by politicy makers". On page 11, this OECD report refers to the Communiqué of the G20 Summit in Los Cabos in June 2012: "Despite the challenges we all face domestically, we have agreed that multilateralism is of even greater importance in the current climate, and remains our best asset to resolve the global economy's difficulties." (G20, 2012, paragraph 8). In Chapter 15, the OECD sketches the idea of developing a multilateral instrument to amend bilateral tax treaties.

[2] In a publication of the French *Conseil d'Analyse Économique*, Bénassy-Quéré, Trannoy, and Wolff (2014a, p.9) advocate a partial corporate tax coordination of a subgroup of countries inside Europe. They suggest: "Therefore, we recommend adopting the CCCTB project or at least some part of it (e.g. base harmonization), possibly through enhanced cooperation (nine countries) or through an *ad hoc* initiative of willing countries." They argue that "an *ad hoc* initiative could be a useful step in the path to further harmonization..." In a feature at voxeu.org, Bénassy-Quéré, Trannoy, Wolff (2014b) further elaborate on this argument suggesting that "...a group of possibly large countries speaking with one voice would have more weight to convince third countries (either EU members or not) to cooperate (see what the US has obtained from non-cooperative countries in recent months)."

gradually, form a coalition of those ready to act now, and then hope that the momentum of this cooperation further enlarges the coalition until a broad international coordination agreement is achieved?

This analysis starts from what is known about the static analysis of a subgroup of countries that collaborate and coordinate their tax policies, compared to the complete noncooperative outcome. Conceptual considerations on coalition formation in the context of trade and taxation have been presented by Burbidge, DePater, Myers and Sengupta (1997). Konrad and Schjelderup (1999) analyze a three-country model and study the static costs and benefits of a partial cooperation of two countries for the members in this group as well as for the bystanding third country. They conclude that both the members of the coordinating subgroup and the bystander country are likely to benefit if the countries' choice variables are strategic complements. Sörensen (2004) offers simulation results that assess the size of these benefits for the coordinating group and for the bystander countries. He finds small benefits for the coordinating subgroup and large benefits for the bystanders.[3] These analyses do not address the question of how this partial cooperation, once reached, affects the dynamics toward a universal coalition in which all countries cooperate and whether partial cooperation makes a global agreement a less or more likely outcome.

In trade theory, the relationship between multilateralism and gradualism is at the center of a major controversy.[4] One deep conceptual contribution to this controversy is the seminal paper by Aghion, Antràs and Helpman (2007). Choosing an abstract model with three countries, they consider

[3]Overall, the issue of partial coordination has attracted considerable attention. Important examples are Haufler and Wooton (2006) who identify possible gains from partial coordination that operate through investment incentives. Conconi, Perroni and Riezman (2008) argue that moderate increases in tax rates due to partial coordination might be welcome in comparison to full cooperation if the global tax union suffers from the problem of time consistent overtaxation of capital. Vrijburg and de Mooij (2016) raise some doubts about the common assumption of tax rates as strategic complements. Finally, Itaya, Okamura and Yamaguchi (2014) study the sustainability of partial cooperation in a repeated game setting. They identify the size of the group of cooperators and the overall number of countries in the global economy as the main determinants. See also Keen and Konrad (2013) for a discussion.

[4]A recent survey is provided by Maggi (2014).

multilateral negotiations towards full global free-trade and compare the equilibrium outcome from multilateralism with gradual negotiations. As their model has no frictions, assumes complete information and has maximum welfare under free trade, they can show an important equivalence result: the eventual equilibrium is always characterized by a global free-trade agreement. However, they also highlight that the choice of the route towards free trade can have consequences for the distribution of welfare gains emerging from global free trade.

Their model is also highly suitable to analyze negotiations about tax coordination agreements. We use this model, and as a starting point of our analysis, we replicate their findings in the context of tax cooperation. We then note that something essential is missing in this approach. It is evident from many deliberations that global coordination is not reached instantaneously. A meaningful theory of gradualism versus multilateralism must allow for negotiation delay or negotiation failure. While the efficiency findings of the AAH model are interesting as a benchmark, they are only a point of departure. We introduce incomplete information as a friction. This friction might lead to international negotiation failure. Such incomplete information turns out to destroy the equivalence result between multilateralism and gradualism. We then identify the drivers for the nonequivalence. We find plausible conditions for when multilateral negotiations are more likely to achieve full global tax coordination than gradualism. Furthermore, we find that incomplete information causes its own distribution effects. We also compare different routes of gradualism with each other. Are negotiations that are most burdened by uncertainty the ones that take place early on, followed by the easier negotiations that are less heavily affected by problems of incomplete information? Or should the most difficult negotiation be delayed until the very end? Sequencing along this dimension matters. We find that under plausible conditions, full cooperation is least likely to emerge if the negotiations with the most uncertain country are delayed to the end. Rather, gradual negotiations are more promising if they start with the most difficult parts.

2 The formal framework

In an adaptation of the tariff competition/union model by Aghion, Antràs and Helpman (2007) (AAH in what follows) to tax competition and tax coordination, consider a global economy with three countries, A, B and C. The countries' choice objects could be tax rates as in most tax competition models or stand for more complex tax system choices. Country A is called the "formateur" due to this country's active role and strong commitment power in the negotiations that will be described below. Apart from this special role, we assume symmetry between the countries, which facilitates the notation compared to AAH.

Three possible states of the global economy exist. One state is the status quo, which can be thought of as representing the unique outcome of a noncooperative Nash equilibrium of national tax policies. The utility levels of countries in this state are denoted by (π^N, π^N, π^N), and we normalize this utility level to $\pi^N = 0$. The normalization assumption is merely for notational convenience.

A second state represents the globally efficient outcome characterized by globally coordinated tax policies. We assume that this efficient system of taxation is unique and, in the absence of intercountry transfers, generates utilities denoted by the vector (π^o, π^o, π^o).

Third, an intermediate situation may come about in which two countries coordinate their tax policies and maximize their joint utilities. Here, the third country is a bystander; it replies to the cooperating countries' actions in a unilaterally optimal way. The resulting payoff vector in this partial coordination outcome is (π^P, π^P) as the payoffs of the cooperators and payoff π^T for the bystander country.

It is further assumed that

$$3\pi^o > max\{2\pi^P + \pi^T, 3\pi^N\} \tag{1}$$

This assumption states that aggregate welfare is highest if the countries agree on what is called global coordination. These are mild assumptions. If $\pi^o < \pi^N$, then it does not make much sense to talk about coordination or cooperation. If $3\pi^o \leq 2\pi^P + \pi^T$, then partial coordination already reaps all the benefits that can be gained from coordination. The partial coordination outcome differs from the global optimum because it does not internalize all externalities between the coordinating group and the bystander country.

While π^o, π^N, π^P and π^T are genuine payoff values that emerge in the three possible states in the absence of direct transfers between countries, we follow AAH and allow for transferable utility; i.e., we allow for direct financial transfers as part of the negotiated contracts. In comparison to the genuine payoffs, we denote the country payoffs that emerge after transfers as w_A, w_B and w_C. We also study two separate bargaining games in what follows: multilateral bargaining and gradual bargaining.

Multilateral negotiations In the multilateral negotiations game, the formateur country A makes simultaneous offers to countries B and C. The formateur can make an offer that, if accepted, brings the global economy to the efficient state. The sum of payoffs there is $3\pi^o$. In a standard tax competition model, for instance, this is the outcome of coordinated tax rates or, more generally speaking, the tax regime that maximizes the global welfare in the world economy. Given symmetry, this overall welfare would be equally attributed to the three countries, such that π^o is the payoff in the harmonized welfare optimum. However, the formateur has full commitment power and makes take-it-or-leave-it offers to B and C. The formateur offers B and C their final payoffs w_B and w_C. If B and C accept these payoffs, all counties move to the globally efficient state. Final payoffs are

$$(w_A, w_B, w_C) = (3\pi^o - w_B - w_C, w_B, w_C).$$

This payoff distribution emerges only if both countries accept the offers. If one or both of them refuse to agree to their respective offers w_B and w_C, then the status quo prevails, and all players end up with their Nash equilibrium utility levels: $(w_A, w_B, w_C) = (0, 0, 0)$.

The formateur optimally offers B and C their payoffs in the noncooperative Nash equilibrium and keeps the remainder. Countries B and C accept this offer. Using $\pi^N = 0$, the resulting payoffs are

$$w_A = 3\pi^o, w_B = w_C = 0.$$

Sequential bargaining The alternative bargaining setup assumes that the formateur first makes an offer w_B to B or w_C to C. This can be thought of as an offer to move into a partial tax union, similar to the situation analyzed in the literature on partial tax cooperation (see, e.g., Konrad and Schjelderup 1999, Sörensen 2004). If this stage-1 offer is rejected, then, following the assumptions in AAH, this ends the game and $(w_A, w_B, w_C) = (0, 0, 0)$. If the stage-1 offer is accepted, then the formateur can make a further offer to the remaining country in stage 2. If this other country also accepts, then the economy ends in the same welfare optimum as in the multilateral game, i.e., the sum of all payoffs is $3\pi^0$. If the stage-1 negotiations are successful, but the stage-2 negotiations fail, then the economy ends in the partial tax-harmonization outcome that was negotiated between A and the country that first received an offer.

Note that A can choose whether the stage-1 negotiations are with country B or with country C. Note also that this does not make a difference here, as the countries B and C are fully symmetric ex ante (it will matter with incomplete information and with asymmetry between B and C).[5] If (1) holds, all players anticipate that they will eventually end up in the grand coalition. Suppose the stage-1 offer goes to B. Then, B is offered some w_B. Country B's reservation payoff is $\pi^N = 0$; hence, $w_B = 0$ is offered and accepted. Entering stage 2, the status-quo utility for C is now equal to π^T. If A offers C its reservation utility π^T as a standalone player in the partial coalition outcome and C accepts this offer, then this yields the final

[5] This negotiation game makes many assumptions. One of these is the strong role of the formateur country. One might ask where the commitment power comes from, whether the formateur role might be allocated by a random process in the different stages or whether a cooperative bargaining concept might be more adequate. Another strong assumption is about the end of all negotiations after stage 1 if the first offer is not accepted. The formateur might consider negotiating with the other country about a partial tax union in this case. One might also discuss more generally the rules of how the benefits in negotiations are shared between players. Aghion, Antras and Helpman (2004) defend many of their assumptions and check their robustness in the working paper version of their published paper. We do not take up this discussion but simply adopt their framework. Our goal is to highlight the role of ambiguity about negotiation costs in this framework.

equilibrium payoffs

$$\begin{aligned} w_A &= 3\pi^o - \pi^N - \pi^T \\ w_B &= \pi^N = 0 \\ w_C &= \pi^T. \end{aligned}$$

Comparison in the absence of incomplete information Compare the formateur country's payoff in the multilateral bargaining and in the sequential, bilateral negotiations:

$$w_A = \begin{cases} 3\pi^o & \text{in} \quad \text{the multilateral game} \\ 3\pi^o - \pi^T & \text{in} \quad \text{the sequential game.} \end{cases}$$

Accordingly, under conditions of complete information, both multilateral and sequential gradual bargaining lead to an efficient outcome. The formateur prefers multilateral bargaining if $\pi^N < \pi^T$ and sequential negotiations if $\pi^N > \pi^T$ and is indifferent in case $\pi^N = \pi^T$.

There are good reasons to believe that $\pi^N < \pi^T$. Konrad and Schjelderup (1999) consider a tax-competition model with three players where two of them choose their tax rates cooperatively and where tax rates are strategic complements; such a game tends to have $\pi^N < \pi^T$. Additionally, the simulation results by Sörensen (2004) suggest that $\pi^N < \pi^T$. Furthermore, in a standard tax competition framework, one might expect that $\pi^T > \pi^P > \pi^N$. Parametric cases in which the bystander does not gain more than the colluding countries, or might even lose or does not gain at all, can most likely be constructed. Still, the advantage of the bystander is a very natural outcome and conforms with the intuition gained from the merger paradox in oligopoly theory, which holds for players' actions being strategic substitutes (as in Salant, Switzer and Reynolds 1983) or being strategic complements (as in Deneckere and Davidson 1985). These considerations also allow for a preliminary assessment of the recommendations discussed in the introduction: moving ahead as a subgroup is not a smart move. Forming such a partial coalition is inferior for the coalition than waiting for the multilateral solution.

3 Incomplete information

The incomplete bargaining framework predicts that global coordination emerges always and without delay. As has been discussed, this framework does not match well with what is observed empirically. A key reason for why bargaining might fail to yield an efficient outcome is incomplete information. One might then like to know whether a global coordination outcome is more likely to be reached under multilateral negotiations or under sequential negotiations. Furthermore, incomplete information affects the distribution of rents and allocates an information rent to the player who has private information. This effect might be stronger or weaker for sequential bargaining than for multilateral bargaining.

We assume that one of the responder countries is fully predictable for A. This country's reservation payoff is common knowledge. We label the fully predictable counterpart country as country B. The reservation payoff of the other responder country C is no longer common knowledge – in a way described in more detail below. This asymmetry in what is known about B and what is known about C generates an important question about the route of sequential negotiations that is absent for ex-ante symmetric private information for both B and C. When making sequential offers, the formateur has to decide whether to negotiate first with the predictable counterparty B and keep the more difficult negotiation for later or whether A should first deal with the less predictable counterparty C. Our setup can address this question.

The possible reasons for incomplete information about country C's reservation payoff in the ultimatum offer game were discussed in the introduction. Politicians make choices on behalf of the country. They may like or dislike accepting bargaining offers as such. Some politicians might see an agreement as a weakness, while others may see it as an indication of ability. Experimental studies of the ultimatum-offer game have unveiled many behavioral payoff-components in addition to material payoff. These include relative standing comparisons, fairness considerations, etc.[6] Moreover, responder behavior is not uniform, which can make the responder's reply to an offer

[6] See, e.g., the overview by van Damme et al. (2014).

somewhat unpredictable, particularly if the offer maker is not very familiar with the responder. We basically assume that A knows B very well and that B cares about the country's own material payoff. The counterparty C is less well-known to A. This asymmetry might be due to the different personalities of the negotiators in B and C or due to a recent office change in country C that makes the new negotiator from C less well-known to the formateur in country A. A responder might be free of these behavioral motives, might even be willing to give up its own surplus for the benefit of global efficiency[7], or might reject offers that push C down close to C's material reservation utility for some of the behavioral motivations discussed. The source of uncertainty might also result from a divergence between the preference of the country and the preference of the politician at the negotiation table.[8]

All these potential sources of ambiguity will be collapsed into a single random variable. Formally, we define a random variable γ that measures the deviation of the decision maker in C from the country's material reservation payoff. We assume that the actual γ is drawn from a random distribution with a cumulative distribution function $F(\gamma)$ that has a compact support and is continuously differentiable everywhere and fulfills the condition

$$\frac{\partial \frac{F'(\gamma)}{F(\gamma)}}{\partial \gamma} < 0. \tag{2}$$

The inverse hazard rate condition holds for many commonly considered probability distributions and is a standard regularity assumption, for instance, in contract theory. Furthermore, we assume $E\gamma = 0$. This makes the results better comparable to the benchmark framework than if $E\gamma \neq 0$ and constitutes a one-step departure from the analysis under complete information. This method allows for us to isolate the effect from incomplete information, rather than from country asymmetries in the first moments of their reservation payoffs. Country C might dislike reaching an agreement (i.e., $\gamma > 0$), or C might like reaching an agreement (i.e., $\gamma < 0$).

[7]For preferences for efficiency, see, e.g., Engelmann and Strobel (2004).

[8]As has been argued by Konrad and Thum (2014) in the context of climate conventions, politicians might have preferences of their own, or they might have to respect the preferences of powerful interest groups or of their political supporters.

Multilateral negotiations with incomplete information In the multilateral framework, the formateur chooses simultaneous offers to B and C. If the full tax union does not come about, then the economy remains in the fully noncooperative equilibrium. In this case, A, B and C receive their reservation utility, which is equal to $\pi^N = 0$. The formateur offers a total material benefit w_B to B and w_C to C if both B and C agree to the full tax union. These values might deviate from π^o, and the difference is a transfer between the formateur and the responder country. Player B accepts this offer if $w_B \geq \pi^N = 0$. The equilibrium offer to B is $w_B = 0$. When solving for the optimal w_C, taking on board that country B is taken care of and will never block the formation of the global coordination, the incomplete information about country C's reservation utility must be accounted for. Country A's objective function for the offer to C is

$$w_A = F(w_C)(3\pi^o - w_C).$$

The first-order condition is

$$\frac{\partial w_A}{\partial w_C} = F'(w_C)(3\pi^o - w_C) - F(w_C) = 0.$$

This determines a unique value w_C as the solution of the equation

$$\frac{1}{3\pi^o - w_C} = \frac{F'(w_C)}{F(w_C)}. \tag{3}$$

Denote this equilibrium offer in the multilateral case as w_C^*. By (2), the solution of (3) also determines the equilibrium probability for which the multilateral regime leads to full coordination. This result is so because $F'(w_C^*)/F(w_C^*) = F'(\gamma^*)/F(\gamma^*)$ such that a given w_C^* determines the critical value γ^* of acceptance cost such that $F(\gamma^*)$ is the probability of negotiation success.

The sequential framework: first negotiating with B and then negotiating with C Suppose A offers some material payoff w_B to B in stage 1. If the offer is rejected, the game ends. If the offer is accepted, then the partial coordination takes place, and stage 2 arrives. If the offer is not accepted, the game ends. In stage 2, country A offers some w_C to country C. Country

C accepts and full coordination applies, leading to global welfare $3\pi^o$. Or C rejects, and the game ends with the partial coordination equilibrium and material payoffs $(w_A, w_B, w_C) = (2\pi^P - w_B, w_B, \pi^T)$. We start with the analysis of the continuation game at stage 2. Let $\hat{w}_B$ be the material payoff that was offered to B and accepted at stage 1. Player C is a bystander to the partial coordination by A and B. This gives the reservation payoff π^T to C. Moreover, C has an acceptance cost of γ. Thus, C accepts A's offer if $w_C - \gamma - \pi^T \geq 0$, i.e., if $\gamma \leq w_C - \pi^T$. The acceptance probability is a function of w_C and equal to $F(w_C - \pi^T)$. The stage-2 objective function of A is

$$\begin{aligned} & F(w_C - \pi^T)(3\pi^o - w_C - \hat{w}_B) + (1 - F(w_C - \pi^T))(2\pi^P - \hat{w}_B) \\ = \; & F(w_C - \pi^T)(3\pi^o - w_C - 2\pi^P) + 2\pi^P - \hat{w}_B. \end{aligned}$$

The value of $\hat{w}_B$ has been determined in stage 1 and is a constant with respect to A's optimization problem at stage 2. The equilibrium offer is implicitly given by the first-order condition

$$F'(w_C - \pi^T)(3\pi^o - w_C - 2\pi^P) - F(w_C - \pi^T) = 0.$$

This can be written as

$$\frac{1}{3\pi^o - (w_C - \pi^T) - \pi^T - 2\pi^P} = \frac{F'(w_C - \pi^T)}{F(w_C - \pi^T)}. \tag{4}$$

Equation (4) has a unique solution for $(w_C - \pi^T)$. Let $\hat{w}_C - \pi^T$ be this solution. Now, turn to stage 1. As B's preferences are common knowledge, and as $\hat{w}_B$ does not affect the continuation game in stage 2 once the offer $\hat{w}_B$ has been accepted, C will make the smallest offer, which B is willing to accept: $\hat{w}_B = \pi^N = 0$.

Condition (4) determines the unique solution $\hat{w}_C$. Moreover, as C accepts if $\hat{w}_C - \pi^T \geq \gamma$, and as $F'(\hat{w}_C - \pi^T)/F(\hat{w}_C - \pi^T) = F'(\hat{\gamma})/F(\hat{\gamma})$, this equilibrium offer also determines the acceptance probability $F(\hat{\gamma})$.

The sequential framework: first C and then B Suppose A offers payoff w_C to C in stage 1. If this negotiation fails, the game ends. If C agrees, they coordinate their tax policies, and the game moves to stage 2.

In stage 2, country A offers w_B to B. We solve by backward induction. Let $\breve{w}_C$ be the offer that was made to C and accepted. Country B's reservation utility is π^T. Thus, B agrees if $w_B > \pi^T$. Among these offers, $\breve{w}_B = \pi^T$ is the one that maximizes A's payoff. This offer is superior to not making an offer if $3\pi^o - \pi^T - \breve{w}_C > 2\pi^P - \breve{w}_C$, or $3\pi^0 > 2\pi^P + \pi^T$. This condition holds due to (1).

Turn next to stage 1. Both A and C anticipate the outcome $\breve{w}_B = \pi^T$ of possible negotiations in stage 2. Player C has a material reservation payoff of $\pi^N = 0$ and agreement costs of γ. Thus, C is willing to accept any offer $w_C \geq \gamma$. For a given w_C, agreement happens with probability $F(w_C)$. The game ends if C does not accept, and A has a utility of $\pi^N = 0$. Using $\breve{w}_B = \pi^T$ and acceptance of this offer by B with probability 1 in stage 2, the objective function of A becomes

$$F(w_C)(3\pi^o - \pi^T - w_C).$$

The first-order condition is

$$F'(w_C)(3\pi^o - \pi^T - w_C) - F(w_C) = 0.$$

This condition can be transformed into

$$\frac{1}{3\pi^o - w_C - \pi^T} = \frac{F'(w_C)}{F(w_C)}. \tag{5}$$

Equation (5) determines the unique equilibrium offer $\breve{w}_C$. Moreover, as C accepts if $w_C \geq \gamma$, and as $F'(\breve{w}_C)/F(\breve{w}_C) = F'(\breve{\gamma})/F(\breve{\gamma})$, this offer also determines the acceptance probability $F(\breve{\gamma})$ that applies in the equilibrium.

Comparisons The following summarizes the three conditions that characterize the equilibrium offers w_C^*, $\hat{w}_C$ and $\breve{w}_C$ to C.

$$\begin{array}{ll} \textit{Case I}\text{: Multilateral} & \frac{1}{3\pi^o - w_C^*} = \frac{F'(w_C^*)}{F(w_C^*)} \\ \textit{Case II}\text{: Sequential; first } B & \frac{1}{3\pi^o - (\hat{w}_C - \pi^T) - \pi^T - 2\pi^P} = \frac{F'(\hat{w}_C - \pi^T)}{F(\hat{w}_C - \pi^T)} \\ \textit{Case III}\text{: Sequential; first } C & \frac{1}{3\pi^o - \breve{w}_C - \pi^T} = \frac{F'(\breve{w}_C)}{F(\breve{w}_C)} \end{array} . \tag{6}$$

These conditions determine the equilibrium offers w_C^*, $\hat{w}_C$ and $\breve{w}_C$ and the critical levels of C's agreement cost $\gamma^*, \hat{\gamma}$, $\breve{\gamma}$ such that C accepts the equilibrium offer in the respective negotiation regime if the agreement cost is smaller or equal to this critical agreement cost. This latter property can be used to compare the probabilities for reaching global tax coordination. This probability is $F(\gamma^*)$ in the case of multilateral negotiations, $F(\hat{\gamma})$ in the case of sequential negotiations with a first offer being made to the fully transparent negotiation partner B, and $F(\check{\gamma})$ in the case of sequential negotiations with a first offer being made to the negotiation partner C who has private information about the agreement cost. Hence, we can write the equilibrium conditions (6) also as:

$$\begin{array}{ll} Case\ I\text{: Multilateral} & \frac{1}{3\pi^o-\gamma^*} = \frac{F'(\gamma^*)}{F(\gamma^*)} \\ Case\ II\text{: Sequential; first } B & \frac{1}{3\pi^o-\hat{\gamma}-\pi^T-2\pi^P} = \frac{F'(\hat{\gamma})}{F(\hat{\gamma})} \\ Case\ III\text{: Sequential; first } C & \frac{1}{3\pi^o-\check{\gamma}-\pi^T} = \frac{F'(\check{\gamma})}{F(\check{\gamma})} \end{array} \quad . \tag{7}$$

The comparison outcome depends on the size of π^T and $2\pi^P$. We show the following results:

Proposition 1 *Compared to multilateral bargaining, if A carries out the complete-information negotiations with B in stage 1 and the incomplete-information negotiations with C in stage 2, then the probability for reaching global coordination is*

$$\left.\begin{array}{c} lower \\ equal \\ higher \end{array}\right\} \text{ with sequential negotiations if } \left\{\begin{array}{l} \pi^T + 2\pi^P > 0 \\ \pi^T + 2\pi^P = 0 \\ \pi^T + 2\pi^P < 0. \end{array}\right.$$

Proof. Compare the conditions I and II in (7). The γ^* fulfilling condition I is larger than the $(ga\hat{m}ma)$ fulfilling condition II if $\pi^T + 2\pi^P > 0$, which in turn implies that the agreement probability $F(\gamma^*)$ exceeds the agreement probability $F(\hat{\gamma})$. The inverse relationship holds if $\pi^T + 2\pi^P < 0$. ■

The result in Proposition 1 is quite intuitive. An interpretation for $\pi^P > 0$ and $\pi^T > 0$ is as follows. The full aggregate material payoff of $3\pi^o$ is obtained only if B and C accept A's offer. Country B always accepts the equilibrium offer. Thus, the probability for reaching global coordination is equal to the probability by which C accepts the equilibrium offer. When A considers the offer made to C, the stakes for A are smaller in the sequential negotiations: first, C already has a higher reservation utility of π^T

rather than π^N. Additionally, A already appropriated an amount $2\pi^P$ of the possible efficiency gains by successfully negotiating partial coordination with B. What is at stake for A, when making an offer to C at stage 2, is less than in the multilateral negotiations. Compared to the multilateral negotiations, it is lowered exactly by $\pi^T + 2\pi^P$. The potential gain from acceptance is lower, but the change in probability from a change in w_C, i.e., the nature of uncertainty defined by $F(\gamma)$, remains the same. In such situations, the ultimatum offer maker chooses a more aggressive offer. If, instead, $\pi_T + 2\pi^P < 0$, then the logic remains the same, but the stakes in the sequential negotiation in stage 2 are higher than the stakes in the multilateral negotiation. Accordingly, the sequential negotiations would make the offer maker more cautious.

We can also ask whether, in terms of expected payoff, A prefers multilateral bargaining or sequential bargaining starting with B. The equilibrium payoff for A from multilateral bargaining is

$$F(\gamma^*)3\pi^o.$$

The equilibrium payoff for A from sequential bargaining starting with an ultimatum offer to B is

$$\begin{aligned} & F(\hat{\gamma}) \cdot (3\pi^0 - \pi^T - \hat{\gamma}) + (1 - F(\hat{\gamma})) \cdot (2\pi^P) \\ = \quad & F(\hat{\gamma}) \cdot (3\pi^0 - (\pi^T + 2\pi^P + \hat{\gamma})) + 2\pi^P. \end{aligned}$$

The comparison depends on the size of $2\pi^P$ and the sign of $\pi^T + 2\pi^P + \hat{\gamma}$. There might be cases where A prefers this type of sequential bargaining compared to multilateral bargaining, even though expected global welfare is higher with multilateral bargaining.

Turn now to the reverse sequencing of negotiations. Let A delay the negotiations with the more predictable negotiation partner B, and start with an ultimatum offer to the less predictable country C.

Proposition 2 *Compared to multilateral bargaining, if A makes an ultimatum offer to C in stage 1, followed by complete-information negotiations with B if the offer to C is accepted, then the probability of reaching global* *tax coordination is*

$$\left.\begin{array}{c}\textit{lower}\\ \textit{equal}\\ \textit{higher}\end{array}\right\}\ \textit{with sequential negotiations if}\ \left\{\begin{array}{l}\pi^T > 0\\ \pi^T = 0\\ \pi^T < 0.\end{array}\right.$$

Proof. Compare the conditions I and III in (7). The marginal political cost γ^* fulfilling condition I is larger (smaller) than $\check{\gamma}$ fulfilling condition III if and only if π^T is positive (negative). Correspondingly, the offer w_C^* fulfilling condition I in (6) is larger (smaller) than $\check{w}_C$ in condition III. Hence, for positive π^T, the agreement probability $F(\gamma^*)$ exceeds the agreement probability $F(\check{\gamma})$. The inverse relationship holds if $\pi^T < 0$. ■

The result in Proposition 2 has a similar intuition as the result in Proposition 1. Suppose $\pi^T > 0$. Sequential negotiations that start with the uncertain respondent C increase the material reservation payoff of B from $\pi^N = 0$ to $\pi^T > 0$. This reduces the stakes of country A in case III compared to multilateral bargaining. For the same given bargaining offer to C in the two cases, bargaining failure is less costly for A in the sequential bargaining case. This induces A to make a more aggressive offer that comes along with a larger failure probability.

We can also ask whether, in terms of expected payoffs, the formateur prefers multilateral bargaining to sequential bargaining (starting with an offer to the uncertain country C). Country A's expected payoff in the case of multilateral bargaining is $F(\gamma^*)3\pi^o$. The expected payoff in the sequential case III is $F(\check{\gamma}) \cdot (3\pi^o - \pi^T - \check{\gamma})$. As $F(\gamma^*) > F(\check{\gamma})$ for $\pi^T > 0$ and $F(\gamma^*) < F(\check{\gamma})$ for $\pi^T < 0$, the formateur prefers multilateral bargaining to sequential bargaining (case III) if $\pi^T > 0$ and prefers sequential bargaining (case III) if $\pi^T < 0$. Incomplete information has no effect on this ranking compared to the complete information case.

Proposition 3 *Sequential negotiations are more likely to be successful if A first carries out the incomplete-information negotiations with C rather than first the complete information negotiations with B if $\pi^P > 0$. The inverse probability ordering holds if $\pi^P < 0$.*

Proof. Compare the conditions for cases II and III in (7). The value $(\hat{\gamma})$ fulfilling condition II is smaller (larger) than $\check{\gamma}$ fulfilling condition III

if and only if π^P is positive (negative). Hence, for positive π^P, the agreement probability $F(\check{\gamma})$ exceeds the agreement probability $F(\hat{\gamma})$. The inverse relationship holds if $\pi^P < 0$. ■

Again, the change in the formateur's stakes from successful negotiations explains this outcome. Let $\pi^P > 0$. Then, the formateur already appropriates the benefit $2\pi^P > 0$ once the negotiations with B are successfully completed. This makes the amount that is at stake for A in stage 2 in the uncertain negotiations with C smaller, compared to the case when these negotiations take place in stage 1 when A has not yet secured some rents. Hence, A's offer is more aggressive when negotiating with C at the very end.

It is also interesting to compare country A's expected payoff in the two cases. The expected payoff is $F(\hat{\gamma}) \cdot (3\pi^0 - \pi^T - \hat{\gamma}) + (1 - F(\hat{\gamma})) \cdot (2\pi^P)$ in case II and $F(\check{\gamma}) \cdot (3\pi^o - \pi^T - \check{\gamma})$ in case III. The comparison generally depends on the size of the parameters π^o, π^T, and π^P as well as the slope of $F(\gamma)$.

The results in Propositions 1-3 can be illustrated in a diagram. Figure 1 combines the relevant functions that determine equilibrium values for all three cases in one diagram. The hazard rate, which corresponds to the right-hand side of (7) in all three cases, is depicted by the downward sloping black curve. The left-hand side of the first-order condition for the multilateral case I is represented by the black upward-sloping line. This curve has an intercept equal to $1/(3\pi^o)$. The intersection with the F'/F curve determines γ^*. This intersection also determines the value of $F'(\gamma)/F(\gamma)$ that applies in the equilibrium, and in turn, this uniquely determines the probability for reaching a global tax union.

The blue line illustrates the left-hand side for the sequential case II with negotiations with C in stage 2, for $\pi^T + 2\pi^P > 0$. The function has an intercept of $1/(3\pi^o - \pi^T - 2\pi^P)$. For each value of γ, the left-hand side function of II has a greater slope than the corresponding curve for I. The intersection of the blue functions that determines $\hat{\gamma}$ occurs to the left of the intersection of the black functions.[9] This implies a higher inverse hazard rate at the point of intersection, which in turn implies a smaller probability

[9]Throughout the paper, we have implicitly assumed interior solutions, i.e., $\lim_{\gamma \to +0} \frac{F'(\gamma)}{F(\gamma)} > 1/(3\pi^o - \pi^T - 2\pi^P)$, as no additional insights can be gained from corner solutions.

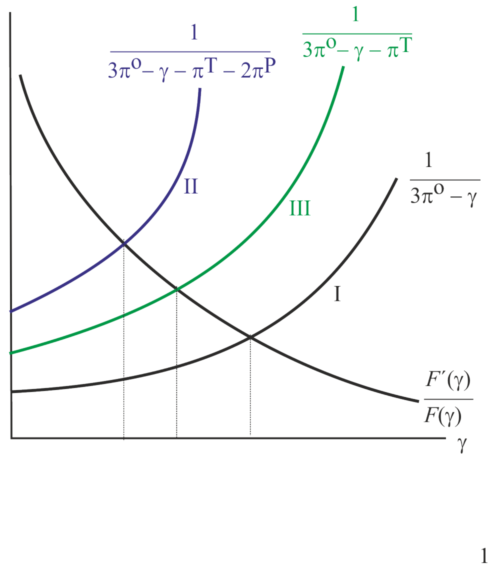

Figure 1: Comparison of Equilibria

$F(\hat{\gamma})$ for reaching an agreement than in the case of multilateral negotiations.

The green line illustrates the left-hand side of the first-order condition for the sequential case with negotiations with C in stage 1. The intercept is $1/(3\pi^o - \pi^T)$, and we draw the case in which $\pi^T > 0$. The intersection of the green curve with the hazard rate curve is above that for the multilateral case but below that of the sequential case with negotiations with C in stage 2.

4 Conclusions

We have analyzed whether multilateral or sequential negotiations provide the better route to global tax coordination, allowing for incomplete information as the reason why negotiations often do not resolve or do not resolve instantaneously. For this purpose, we have transferred the model by Aghion, Antràs and Helpman (2004), which was originally designed to analyze free-trade negotiations with complete information, into the world of tax coordination. This re-interpretation of their model is perhaps interesting in its own right, but it is also the starting point for our main focus of interest.

One key question is how does the sequencing choice affects the probability of reaching a globally efficient outcome. We can determine which factors make multilateralism superior to sequentialism or not and which type of sequentialism is superior. We can also determine the distribution of rents and what this implies for the preferences of the 'formateur' country, that is, the country that is the main powerful driver behind the negotiations.

The analysis has shown that the neutrality between sequential and multilateral bargaining breaks down once incomplete information is introduced. Multilateral bargaining achieves the globally efficient tax coordination with a higher probability than sequential bargaining under plausible conditions. With sequential bargaining, sequencing matters. The probability for a global agreement is higher when negotiations start with the candidate country that exhibits more uncertainty with respect to the costs of an agreement (for the plausible case of positive gains from partial tax coordination). The formateur country, which wants to maximize own expected rents, will prefer multilateral negotiations over sequential bargaining, where offers must be made to the less transparent country first. However, we cannot rule out that the formateur country does not choose sequential negotiations with the transparent country receiving the last offer. This negotiation procedure has the lowest success probability but may nevertheless maximize the formateur's expected rent.

We used ultimatum offers to describe intercountry bargaining. This provides a simple but formally convenient framework for analyzing international negotiations and follows the tradition laid down by AAH (2007). It is tempting, however, to leave the model framework and to also speculate about what would happen if countries or country groups negotiate and reach a cooperative Nash equilibrium rather than an ultimatum offer equilibrium. Consider sequential negotiations. Suppose two countries reached a Nash bargaining agreement in stage 1. Suppose bargaining continues in stage 2 and is between the countries that are already cooperating and the country that was a bystander in stage 1. Successful negotiation in stage 2 has efficiency gains and can be split between these two parties. If the bystander country gained more from the partial coalition of the other two countries than the coalition countries themselves gained from the outcome in stage 1, then the bystander country has reached a better threat-point for the stage-2 negotiations. The standalone country is then likely to receive a higher surplus in case of sequential bargaining than in case of multilateral bargaining. As the total size of the efficiency gains are given, countries should generally have an interest in avoiding entry into a partial coalition early on. They should be happy if others form such coalitions and wait. This view by which partial tax cooperation is not the end of the game but somehow reverses the policy recommendations that could be drawn from previous literature results in such partial tax cooperation. To formalize such a cooperative negotiation process is difficult, however, raising many conceptual questions, such as whether a coalition formed in stage 1 is seen as one or as two players or receives one or two shares of the surplus in stage 2.

There are clearly many more aspects of multilateral versus sequential bargaining that are worth analyzing in a more complex formal setting. For instance, the formateur country may have less than perfect commitment power, thus allowing for rounds of renegotiations once the initial bargaining has failed. Commitment once an agreement has been reached is also an issue in an international environment. In an enlarged multicountry setting, the formateur country may also be able to build up reputation for not renegotiating. Finally, the offer-receiving countries may use the uncertainty about their own type strategically. A country whose cost of acceptance is known to the formateur ends up with zero rents. Hence, it might pay using opacity strategically to extract positive rents from the negotiations on global tax coordination.

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