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Abstract

The Zollverein, a customs union, of 1834 was the outcome of sequential accession negotiations between Prussia and other German states. This paper applies a bargaining model to analyse the choices of negotiation structure and institutional form of a customs union. The existence of negative coalition externalities, the effect of a new coalition on non-participants, led the agenda setter, Prussia, to choose sequential over multilateral negotiations. Institutionally a customs union structure provided a higher payoff for the agenda setter than capturing the welfare gains from the differential tariff setting in a free trade agreement, explaining the choice of a customs union

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1 Introduction

The rise of nation states was closely associated with the rise of unified customs territories of unified political entities. The Zollverein, the 1834 customs union between German states, however was the first international trade agreement that created a unified customs area between independent sovereign nations. This unification of trade institutions without concurrent political unification created the template for similar agreements and provides therefore a historically important example (Viner, 1950). It is used here as a case study to explore the mechanics and factors that shape the creation process and institutional structures of trade agreements.

There is a contemporary debate, often labelled as stepping stones versus stumbling blocs, about the role of regional trade agreements in the creation of multilateral agreements (Aghion, Antras and Helpman, 2007). The Zollverein is an early and clear example where intermittent agreements rather than multilateral negotiations were the origin of the resulting general agreement. Traditionally the economic history literature however has focused on the reasons underlying the existence of the Zollverein rather than its creation. It does not explain the realized nature of the formation process including those characteristics, like the sequential negotiations, that help to draw lessons about the nature of trade agreements in general.

This paper focuses on the origin and emergence of this institution. It demonstrates that the situation of the German states in the early 19th century fits a particular game-theoretic structure, whose logical conclusions explain the creation process of the Zollverein customs union. Using an analytic narrative approach the analysis illuminates the structural factors that explain the institutional as well as negotiation structure and thereby more generally the nature of the formation process of trade agreements. The main focus is the role of coalition externalities, the effect an agreement, a coalition,

between some states has on those not involved.

In the second half of the 19th century the beginning historiography about the creation focused on Prussia's hegemony. One particularly influential interpretation was given by Treitschke (1872), who saw the Zollverein as a first step towards German unification under the enlightened guidance of the Prussian monarch. This nationalistic view interpreted the Zollverein as a move by Prussia to assert hegemony over Germany and diminish the influence of its rival, Austria. This view began to be challenged in the 20th century, where, for example, Taylor (1946) and Kitchen (1978) argue that Prussia's motives were initially of economic nature and only became political later on. Murphy (1991) provides a differing political interpretation, arguing that the Zollverein was intended as a political bulwark against France. The theory commonly accepted in the current economic history literature (Williamson, 2006; Alesina and Spolaore, 2003) was introduced by Dumke (1976; 1994), and emphasizes huge fiscal savings due to economies of scale in customs administration. Financial gains, which resulted from these savings, were therefore the main incentive for the creation of, and participation in, the union. Although there are further works about the formation process (Henderson, 1984; Hahn, 1982), these are rather descriptive in their approach and do not provide a structural analysis explaining the observed structures of the formation.

The Zollverein was part of the institutional modernization process in German states which started during the Napoleonic wars and affected customs and tariff structures and the emergence of modern, external customs systems. In 1828 the first customs union agreements were concluded, which then evolved in the following years leading to the establishment of the Zollverein on January 1st, 1834 as a customs union of seven¹ German states.

¹This counts the group of officially independent Thuringian principalities as a single entity.

Over the next three decades a number of further states joined this customs union, which saw substantial structural changes after the 1866 war between Prussia and Austria and then become part of the political structure of the German Empire after its founding in 1871 (Henderson, 1984; Hahn, 1982). The Zollverein had no internal customs borders and common external tariff rates which, like any decision, had to be set unanimously by a congress of all member states that met approximately all three years. The actual border controls and customs administration was still in the purview of the national services. The net revenues, after the states' costs for border customs administration were compensated, were split according to population size. The necessary calculations were made by a small standing office in Berlin, which only had administrative functions. Due to their relevance for trade the Zollverein treaties also contained restrictions on public monopolies and producer taxes within the individual states. The Zollverein further harmonized weights and measurements as well as standardized the acceptance of multiple currencies in use throughout its territory (Henderson, 1984; Hahn, 1982).

The issues of the formation and nature of trade agreements do receive attention in the modern trade literature, especially with regard to the design of a global trade architecture and the role of regional trade agreements through which it can advance. As Evenett (2004) outlines there are three approaches to explain the formation process of such trade agreements. The first two, *Technocratic Entrepreneurship* and *Geopolitics and Mercantilism*, focus on the respective role of technocratic experts as well as geostrategic and mercantilistic motives without providing a clear structural framework. The third, *Domino Regionalism*, does by stressing cascading political economy effects of trade creation and diversion effects. Formalized by Baldwin (1999), in this approach an idiosyncratic event changes the internal political economy within one state, which then joins the trade agreement. The result-

ing trade creation and diversion effects lead to political economy changes in another country, causing it to join as well.

In the same vein P. Aghion, P. Antras and E. Helpman (2007) develops a bargaining model based on an underlying cooperative game. That model, more general than Baldwin's approach, provides a theoretical framework for the role of regional trade agreements in building a global free trade agreement and is flexible enough to allow general conclusions about the nature of the formation process. The central feature is the existence of coalition externalities, which represent the impact regional, intermediate agreements have on states that are not involved. These externalities turn out to be the main determinant for the structure of the formation process. The model's general nature also allows its application to historical circumstances, so I utilize this approach to interpret the formation of the Zollverein, shedding new light on the development of this institution as well as providing a case study for the formation of a customs union. My central argument is that the historical situation of German states in the early 19th century fits the setup of this theoretical model by Aghion et al very well; the logic of the model, including the presence and particular nature of coalition externalities, explains therefore the observed formation process, in particular the bargaining structure of bilateral negotiations and the institutional form of a customs union.

The nature of the formation process of trade agreements has implications for other effects, for example a possible endogeneity between the membership in trade agreements and the effect of such a membership on trade flows between states (Baldwin, 2006; Wolf and Ritschl, 2011). Keller and Shiue (2015) shows such a relationship for the Zollverein using one of the factors presented in this paper, namely international market access based on geographic location, as an instrument for a state's accession into the customs union. This paper complements that particular analysis by providing a structural framework which explains that utilized correlation and embeds it within

the formation process.

Section 2 describes the game-theoretic setup and underlying historical context, in particular players, their potential actions and centrally the nature of coalition externalities. Their impact is then demonstrated in the next two sections, which explore their influence on the observed bargaining structure and institutional choice. The final section concludes, in particular with a discussion about the implications for the sequence of negotiations and the importance of coalition externalities.

2 A Formation Framework

P. Aghion, P. Antras and E. Helpman (2007) provides a game-theoretic framework for negotiations about trade agreements. Their model is framed as a non-cooperative game, but their setup, a group of states negotiating without strong restrictions on the agreement structure, resembles closely a cooperative game with transferable utility between the players. Such a game has a number of players decide on cooperative actions by forming coalitions. This approach however usually focuses on the resulting coalitions of states, in this case trade agreements, without specifying the bargaining and formation process. It is therefore combined with a bargaining structure which determines the specific characteristics of the formation process and resulting payoff outcome.

Their main analysis uses the three-country case but it can easily be generalized to more players. The outcome of the bargaining game is a partition of all players into coalitions, which are non-overlapping subsets. If a coalition has more than one player it represents a trade agreement between all coalition members. A value function, which stems from the underlying cooperative game, gives the payoff for each coalition and depends consequently on the objective function of the involved actors. Aghion et al. use mainly

aggregate welfare as the objective in modern negotiations, however this isn't fully appropriate for the case of the Zollverein. The aims, and consequently the payoffs, of historical tariff and trade policies will be discussed later on.

The first stage of the bargaining game is the decision of the agenda setter, the leading state, about the negotiation structure. It can choose either a multilateral approach, making simultaneous offers to all other players, or a sequential approach, starting with an offer to only one country. Under multilateral negotiations, states weigh their received offers individually and simultaneously respond with a "yes" or "no" decision. If at least one state refuses to accept, the negotiations fail and no agreement is reached. The resulting outcome is therefore either a global agreement or no agreement, which leaves all states on their own. Under the sequential approach the agenda setter makes offers to the individual states sequentially. If one state decides to reject the offer, the negotiations stop and the result is an agreement with all the countries which had received and accepted their offers prior to this first rejection. The extensive form of the bargaining game is depicted in figure 1.²

The membership offer has under both negotiation structures an associated pay-off, which may contain lump sum transfers between states and is unaffected by other states joining the agreement later on. This structure leads Aghion et al. to define the concept of coalition externalities.

There are *positive* coalition externalities in a country when its payoff, and consequently the reservation price of joining the coalition, increases when two or more other states form a coalition. *Negative* coalition externalities imply that the countries payoff decreases in such a case, and no coalition externalities exist if the payoff does not change.

So positive coalition externalities imply that one country profits from an agreement between other countries, negative coalition externalities imply

²Figure 1 is taken from Aghion et al. and is labelled with their formal notation.

that it loses.

The following shows how the historical setting of Germany in the early 19th century explains the basic setup underlying this framework. First the set of players is discussed, in particular also the identity and role of one specific player, namely the agenda setter. This is followed by a description of their set of actions, split into the relevant policy domains as well as the possible range of institutional arrangements.

2.1 Set of Players

The model has two types of players, the agenda setter and regular players. The following shows how the states that were members of the *Deutsche Bund*, the common political governance institution for German States created by the Congress of Vienna in 1815, fit this approach. The discussion therefore clarifies which of these members states were relevant players as well as why certain ones, as well as all non-German states, were not.

The institutional structures of the *Deutsche Bund* had three different categories of member states, first Austria and Prussia as part of the great European powers that served as guarantors for the acts of the Congress of Vienna and then the constitution of the *Deutsche Bund*; second, a number of mid-sized powers, for example Bavaria and Hannover, with full voting rights in its Diet; and third, smaller principalities and free cities as part of shared voting arrangements (Angelow, 2003).

Prussia and Austria were essentially agendasettlers for the *Deutsche Bund*. Consequently they also were potential agendasettlers for trade negotiations, which will be discussed in more detail later on.

The main set of players is the second group, mid-sized states with full voting rights. This group contains Baden, Bavaria, Hannover, Hesse-Cassel, Hesse-Darmstadt, Saxony and Wuerttemberg. Most of these states had be-

gun to institutionally modernize following the French or Prussian examples. One important reform in a number of states was the institution of a new customs system, in particular the move to external border systems and abolishment of internal tariff borders. Related to the modernization of tariff systems, a number of these states started to negotiate in varying constellations with each other about trade agreements. These negotiations however failed to result in more than short-lived and narrow agreements (Henderson, 1984; Müller, 1984). Their participation demonstrates that these states were active on their own behalf in trade negotiations yet none had a dominant position. This implies that they all fit the profile of regular players very well.

The third group are small, though independent, states that did not have their own voting rights. The constitution of the German Federation specified groups of states with a common vote, the actual voting arrangement was up to the group members. Due to their size, non-contingent geographic locations and independent participation in early trade negotiations some of these groups however should be split up. In particular I dissolve the group of Braunschweig and Nassau, the two largest states under this arrangement, and classify them as individual players. I do the same for Oldenburg, as well as the group of free cities, in particular Frankfurt, Hamburg and Bremen. Alternatively it is possible to include a coalition of such states as a single player. This is appropriate for the Thuringian principalities, which had a shared voting group and end up with a shared membership in the Zollverein as well.

This leaves a number of small geographically dispersed principalities, which were combined in a number of voting blocs. In contrast to their Thuringian counterparts, they had no clear dynastic, geographic or other connection. Some of them, for example the Anhalt principalities, were enclaves within the territories of other states, in their case Prussia. This led to a treatment of these small principalities similar to that of enclaves of other,

larger states. These areas were usually not considered to be separate customs territories but absorbed into the tariff systems of the surrounding state.³ The actual sovereigns of these enclaves were usually compensated financially for the loss of tariff revenues, normally loosely based on the number of enclave inhabitants. Since these small principalities surrendered their tariff policy rights to the larger neighbours, they did not participate in trade negotiations and are therefore not considered as a players in these circumstances.

Another set of states which were not players are the neighbouring states Denmark, the Netherlands and Switzerland. The Swiss had received a guarantee of their absolute neutrality in the Congress of Vienna and saw any sharing of sovereignty through the involvement in a customs union as unacceptable for them. Denmark owned the German principality of Holstein-Lauenburg, an official member of the Deutsche Bund, but the Danish King preferred consistency of economic policy within his dominion over a possible membership in the Zollverein. Similar to Denmark, the Netherlands owned a principality, Luxembourg, which was considered to be German, i.e. a member of the Deutsche Bund. Luxembourg joined the Zollverein in 1842 as part of the Prussian tariff system due to political pressure. One of the fortresses of the Deutsche Bund was located there, which led German states in the Zollverein to secure the adhesion of Luxembourg, once France had floated plans about a possible customs union. (Henderson, 1984) The Netherlands itself had a trade policy which tried to extract as much as possible from its favourable geographic position, controlling the Rhine's mouth into the North Sea. This position would have made an accession into the Zollverein

³This usually meant that the small state would be treated as a territory of the larger state with regard to customs and trade issues. Furthermore customs officials from the larger state might have the right to enter the smaller states territory in official capacity. For example Schwarzburg-Sondershausen allowed Prussian officials to enter the territory for investigatory purposes, but arrests and related police functions were still the purview of local authorities (VBDZ 35)⁴.

too costly for Prussia, and led it and the Zollverein to cooperate closer with Belgium, which was seceding from the Netherlands at the time.⁵ An important part of this cooperation was the creation of the "Iron Rhine", a rail connection between Antwerp and Cologne, which connected the Rhine to the North Sea by avoiding the Netherlands (Van Zanden and Van Riel, 2004).

A final neighbour that had the potential to get strongly involved into German trade agreements was France. In contrast to the afore discussed foreign states, France had the size, economic strength and historical political importance to become a leader than just a follower state, so is included in the following which discusses the role and identity of the agenda setter.

2.1.1 Agenda setter

As mentioned above after the Napoleonic wars there was a small group of major powers that guaranteed stability in Europe. The two leading German nations, Prussia and Austria, as well as neighbour France were part of this group. This strategic importance, which was also based on economic characteristics, implies that these nations had a superior position within German politics, including trade negotiations with other German states. Formulated in the framework of the game they can be seen as a distinct class of players that have a special set of actions to which follower states react to in their actions. Such a player is called agenda setter.

Prussia was the only one of the three that got actively involved into the negotiations and was therefore the only state that took on the role of an agenda setter. It actively assumed this role in 1828 when it opened negotiations with Hesse-Darmstadt (Hahn, 1982), but two prior decisions already

⁵Belgium seceded from the Netherlands in 1830. The treaty of London in 1839, in which the Netherlands recognized Belgian independence, contained a clause allowing Belgium the construction of the rail link between the Rhine and the North Sea (Van Zanden and Van Riel, 2004).

foreshadowed this decision. The first was Prussian refusal to follow up on the mandate for closer economic cooperation given to the *Deutsche Bund*, which is discussed later on in the context of the negotiation structure. The second is its enclave policy, in particular its domineering behaviour. Although the inclusion of enclave territories within the trade area of the surrounding nation was nothing extraordinarily new⁶, Prussia's unilateral imposition of this policy in 1818 on a number of independent enclaves was. The inability of the affected principalities to reverse or even even change the terms of this imposition shows the ability of Prussia to dictate the structures of trade negotiations.

Similarly, both France and Austria had the potential, due to their size and geographical location, to become agenda setters for trade policy between German states. Neither grasped the opportunity, mostly due to their preferences for strong protection and against differential tariffs (VBDZ 772). Importantly, the geographical situation also did not present as extensive opportunities for administrative savings as it did for Prussia. This implies that the possible pay-off from trade agreements with German states for both France and Austria were considerably lower than for Prussia. As a consequence Austria took a passive stance towards the first rounds of negotiations conducted by German states and a policy of accommodation towards Prussia (Branchart, 1930). The French government was acting in a similar way to its Austrian counterpart. Despite receiving repeated letters from its Bavarian and German representatives, detailing the possibility of gaining influence over German states through trade policy, the French government did not

⁶Prussia's negotiations with independent enclaves in 1818 contain calculations, which demonstrate that the inclusion of (non-independent) territories of other German states within Prussia's tariff line was a common occurrence. The tariff territory of Prussia's eastern provinces contained about 166000 foreign subjects, while about 205000 Prussian subjects were included in the tariff areas of other German states.(VBDZ 31)

deviate from its high tariff policy, angering possible allies in Germany. Furthermore, this stance did not change much through the July revolution in 1830 (Krauss, 1987).

After Prussia had assumed the role of the agenda setter in 1828 through its involvement in negotiations with other German states, neither France nor Austria contested that move. Both states however did not see a Prussian success at forming a customs union with other German states as beneficial for them either. This didn't cause them to become active players, but it allowed other German states to use their backing and weight in negotiations with Prussia, which is explained in more detail in the discussion of coalition externalities.

2.2 Set of Actions

The role of the agenda setter during the formation process is formally stylized into two main characteristics. First, the agenda setter has the right to decide when and with whom negotiations are opened. More precisely Prussia had to choose as a first step between opening multilateral negotiations, i.e. simultaneous negotiations with all follower states, or bilateral ones, which additionally require a decision about the sequence in which these would be conducted. Second, the agenda setter proposes the membership terms for each state it opens negotiations with. As a consequence follower states have only to act in a single instance, namely they can accept the proposed terms and join the agreement or reject the offer and stay outside.

While the decisions to open negotiations and to accept or reject membership offers are clear, the proposal of membership had two main dimension, first the policies areas covered in the agreement and second its institutional structure.

As introduced above, all states were members of the Deutsche Bund. This

implies that there existed a political institution which already affected and coordinated a number of policy areas between these states. In particular security related topics were already covered, most notably a institutionalized military cooperation between the member states. The existence of these structures implied that these issues were the topic of separate negotiations between German states and therefore excluded from the discussions about the Zollverein (Angelow, 2003). Article 19 of the *Bundesakte* (VBDZ 156), the constitution underlying the Deutsche Bund, contained the intention, and thereby an authorization, to coordinate trade and customs policy⁷, the Bund however did not follow up on that and left these issues to the individual member states (Angelow, 2003). This implies that the range of topics potentially to be considered in the negotiations of the Zollverein were predominantly economic policies, in particular a range of tariff and non-tariff trade barriers. Next to customs, this also covered internal issues like tax structures, monopolies and privileges, currencies, legal structures and regulatory issues. Another related area for negotiations were the trade relationships with foreign nations.

One major trade related issue that was already dealt with by international cooperation was the regulation of shipping on the Rhine and Elbe, the two main navigable rivers, which was the result of explicit calls by the Congress of Vienna. Based on international agreements two official commissions were established that put the regulation principles postulated by the Congress of Vienna into practice (Angelow, 2003). As with the linkage to other policies, this separate treatment resulted in a removal of the issue from the set of topics covered by the Zollverein.

The negotiations were therefore focused on a particular set of economic issues, but this didn't limit the potential institutional form of the outcome.

⁷This is further discussed in the section on the bargaining structure, since it provided the possibility of an institutional framework for multilateral negotiations.

The players, the states, were free to choose any institutional agreements short of a political unification. This allowed for bilateral as well as multi-lateral arrangements, either free standing or in case of the latter potentially embedded into the Deutsche Bund structure. Furthermore, the players' negotiations also covered the length of the agreement with possibilities ranging from one time actions to permanent agreements.

2.3 Coalition Externalities

Coalition externalities are a main factor in the model determining the outcome of the negotiations, including bargaining structure, institutional characteristics and the eventual accession sequence. Their importance is based on their role in shaping pay-offs for all players involved. Aghion et al. justify their prominence by emphasizing their existence in trade creation and diversion effects of the formation of trade agreements.⁸ Nevertheless, this assumes that the utility function of the relevant actor, in modern settings usually a democratic government, is predominantly concerned with general economic welfare. This is not reasonable for early 19th century German states, where political power rested to a large degree with individual sovereigns or a small elite with preferences focused on fiscal and more mercantilistic notions.

As these externalities are the main factor changing the pay-off of players they therefore drive trade and tariff policy choices within trade negotiations. This implies that identifying the historical factors shaping these policies allows to identify the main coalition externalities present during the time of the Zollverein. The following discussion therefore outlines historically important goals for trade policies and their precise applicability in the context of externalities for trade negotiations between German states.

⁸Rieder (2006) shows the existence of these trade diversion and creation effect externalities empirically for the case of the European Union.

Following the analysis of world tariff setting between 1789 and 1938 by Williamson (2006) three central motives are identified: a revenue motive, a strategic tariff motive and a Stolper-Samuelson factor compensation motive. The first is based on fiscal reasons, governments set tariffs with the intention of raising revenues for the state's or even the sovereign's personal budget. The second is based on the idea of strategic tariff setting. At the time of the Zollverein this motive focused predominantly on reciprocal market access. This implies that states change their tariffs to either elicit reciprocal responses by other countries or as a reciprocal reaction to other states. The third motive concerns the internal political economy of countries, more precisely a connection between trade and politics based on the Stolper-Samuelson theorem and extensively explored by Rogowski (1990). Tariff rates affect relative prices between sectors, for example agriculture and manufacturing, and therefore the relative income of these sectors. Their members have therefore an incentive to influence tariff setting and the resulting relative rates reflect the relative strength of individual sectors.

The coalition externalities caused by the expansion of a customs union on states outside of the union are therefore located in these areas. The framework implies that the agenda setter profits from stronger negative coalition externalities, since these lower the pay-off necessary to entice a state to accept a membership offer. It will therefore try to maximize the impact of the effects in these three areas.

The first set of externalities are the effects on tariff and fiscal revenues. A new coalition can affect the revenue of a third state in two major ways. One is the change in trade volume. A coalition can cause trade to be diverted or even prevented, which triggers the trade volume of the outside country to sink. This consequently lowers the revenues from tariffs. A coalition can also affect revenues through the diversion of trade routes. Major trade routes bolster revenues through transit tariffs and through demand for

services along the route. Affected services are, for example, logistics, transportation, housing, food, or access to markets such as fairs. Governments are able to levy taxes and fees on these and derive in this way revenues from trade. Traffic patterns change when tariff barriers change, free traffic within a coalition entices merchants to use routes in customs union territory, and outside countries lose revenues.

The second area is international trade politics. Given geographical positions, a coalition might be able to obtain control over all relevant trade routes leading into a country not within the customs union. The coalition obtains in this way a certain degree of control over the tariff system of the country in question, since traders cannot evade transit tariffs on trade conducted with the state. High transit tariffs therefore have a similar effect to that of a high tariff rate of the country itself. This poses problems for a state which has the intention to secure market access through reciprocal preferential treatment and therefore wants to implement a low tariff system. The state is no longer able to offer low trade barriers to another state, and consequently cannot offer the necessary reciprocation. In the extreme, the coalition can go as far as treating all goods destined for such an outside state as regular imports into the customs union. For practical purposes, the state loses control over its customs system. The power to determine one's own tariff system is a question of political sovereignty; losing that power threatens the political situation of the sovereign. This was a real fear for the sovereigns of smaller German states in light of the mediatization process of independent states, started through the Reichsdeputationshauptschluss of 1803, where stronger states absorbed small, formally independent, territories under their reign. The rulers of the remaining small principalities only had guarantees by the Congress of Vienna to secure their dynastic rights and therefore had the fear that a loss of control over trade policy would be the first step of being absorbed by larger neighbours, in their case, especially, by Prussia.

The last issue is internal political economy. Rogowski's framework stresses the effect of tariffs on factor compensation and therefore on the relative political power of different sectors. Prussia's tariff system of 1818 is an example of this; its moderate tariffs were a compromise between the demands of agriculture, located predominantly in Prussia's east, and the industrial and commercial interests in the western parts of its territory. The Zollverein essentially took over Prussia's moderate rates, which were neither prohibitive nor free trade-oriented.⁹ The adoption of these tariff rates by new member states had only minor effects on the relative strength of different sectors due to this moderation. The effect of neighbour states joining the Zollverein had less of a differential impact on sectors than it had on different regions. Regional interests played an important part in tariff choices, as Prussia demonstrates. Its customs system not only balanced commercial and agricultural interests, but also represented a compromise between the eastern and western territorial parts of Prussia (Ohnishi, 1973). The geographical structure of a number of German states, with the most prominent example of Prussia, was a combination of sometimes completely unconnected territories. This had strongly differing regional interests as a consequence. An accession of neighbouring states into the Zollverein changed the relative strength of regions, shifting political power and interest. This change in the internal political economy of a state can influence its government to look more favourably on the Zollverein and thereby reduce the necessary pay-off required to convince the state to join.

Since coalition externalities reduce their pay-off states obviously have the incentive to prevent or reduce them before they receive a membership offer. Governments had a number of options to do so. To counter effects caused

⁹Prussia targeted a tariff rate of 10% at the institution of the tariff in 1818. The tariff was, however, based on weight and not value, and subsequent price decreases raised tariff levels considerably over the target rate.

through a coalition's control over roads, states had to find ways to secure access to unimpeded trade routes. Some of the possibilities were building or improving roads going through their own territory as well as coordination agreements with other states. To counter the potential international effects, states had to use reciprocal power before they were cut off. This implies that they preferred to conclude formal diplomatic agreements with foreign nations, locking in preferential treatment with regard to market access. In addition, a state might commit itself by treaty not to join the coalition, which serves as a signal to foreign states and raises the, predominantly political, cost that the agenda setter has to pay to overcome the necessary breakup of an official treaty. To counteract effects on the internal political economy, governments have limited options. Since these effects cause shifts in relative power and demands, governments would need to make concessions to specific regions and sectors. These concessions, for example tax relief, are costly from a government viewpoint; therefore, it might be more profitable to accept the externalities than to attempt to mitigate them.

3 Bargaining structure

The existence and nature of these coalition externalities have important ramifications. The main impact is their influence on the the agenda setter's decision between multilateral and bilateral negotiations as well as the sequence of bilateral negotiations, if the latter are chosen.

To decide whether to opt for multilateral or for sequential bargaining, the agenda setter compares the pay-off resulting from multilateral negotiations¹⁰ with its pay-off from sequential bargaining.¹¹ As the agenda setter has the

¹⁰Formally, the pay-off in the multilateral setting is the core allocation where follower states receive their lower bound pay-off and the agenda setter its upper bound pay-off.

¹¹This also assumes that there are no further negotiations or redistribution after the

power to determine the order in which states receive an offer it can select the optimal sequence to secure the highest pay-off. Sequential bargaining will be selected if this payoff is higher than that from multilateral negotiations. The agenda setter will however choose multilateral negotiations if their pay-off is higher. This is conditional on the relevant pay-off being positive; the agenda setter will not start negotiations if it doesn't profit from them. Prussia's timing in the case of the Zollverein will be discussed later on.

Sequential, bilateral negotiations involve the formation of intermittent trade agreements. If coalition externalities exist these newly formed coalitions therefore affect the reservation price of other states to join the agreement. This consequently also changes the pay-off to the agenda setter from including those states in the agreement. This raises the question what externality characteristics and structures result in a preference for bilateral negotiations. The model implies that the existence of negative coalition externalities in at least one country is a necessary and sufficient condition for the choice of sequential negotiations in a setting with three countries. In a setting of more than three countries it is no longer sufficient¹², but still a necessary condition for the same choice. The agenda setter will choose bilateral negotiations if the negative, lowering effects on the reservation prices of other states outweigh the positive, increasing effects.

The bargaining structure of the model has a particular assumption about the resulting outcome. In both cases the rejection of a membership offer by one state ends the complete negotiation process. For sequential negotiations this results in a coalition of all states which had accepted an offer prior to the rejection while for multilateral negotiations this results in a complete conclusion of the agreement. In the case of the Zollverein the unanimity rule for treaty changes essentially prevented any such modifications.

¹²The existence of negative coalition externalities is still sufficient if no positive externalities exist.

breakdown of negotiations without any trade agreement. Aghion et al. justify this modelling choice with references to current voting procedures within the WTO and EU. Here I demonstrate the suitability of this assumption for the Zollverein in light of Prussia's actions and the trade negotiations of other German states at the time.

It starts with showing that multilateral negotiations were actually a possibility for the agenda setter. The institutional framework of the Deutsche Bund offered Prussia the opportunity for multilateral negotiations, there are however two particular moments when its government explicitly rejected such an approach. The first was the attempt by a number of states to follow up on the mandate of closer commercial integration articulated in the afore mentioned *Bundesakte*. The full plenum, in particular due to Prussia's influence, never followed up on this mandate in any serious way and nothing came out of the initial impetus. The existence of this article, including the fact years later some states again petitioned for multilateral negotiations based on this article, demonstrate that there was an institutional framework which made such negotiations between German states possible, and that Prussia rejected such an approach (Arning, 1930). Another moment was Prussia's reaction to the *Mitteldeutscher Handelsverein*, an association of a number of German states which formed in reaction to Prussia's first customs union agreement with Hesse-Darmstadt. Prussia insisted to negotiate only with individual member states, thereby rejecting any calls for negotiations with all of the *Handelsverein's* members combined (VBDZ 609) (Haferkorn, 1933).

Moving to the question of the breakdown of negotiations, historical evidence shows that failed multilateral negotiations did not result in smaller coalitions. As indicated above a number of smaller German states were negotiating during the 1820's. Although they occasionally reached agreements these always fell apart before they could be implemented. These failures however were usually complete rather than resulting in agreements between

the states that did not change their views on the proposed terms¹³.

Facing the outlined choice between bilateral and multilateral negotiations, Prussia opted for bilateral, sequential ones. This implies that the agenda setter's pay-off from a sequential approach was higher or at least as high as the pay-off from a multilateral approach. If coalition externalities existed then indifference between the two negotiation methods required that positive and negative externalities of the optimal sequence were balancing each other out. If the choice was due to a preference of sequential negotiations then negative coalition externalities had to be dominant during the formation of trade agreements between German states in the first half of the 19th century.

The structure of the model implies that in case bilateral negotiations were chosen due to the existence of coalition externalities the sequence of negotiations was optimal, maximizing negative externalities. In Anonymous (2014) I analyse the complete sequence of accession treaties to the Zollverein using this theoretical framework and the implied optimal sequence. There I demonstrate extensively the existence and strong dominance of negative coalition externalities during the Zollverein negotiations. In particular I show that the conclusion of bilateral accession agreements had strong externality effects in the three trade policy areas, financial revenues, market access and political economy, outlined above.

To illustrate this the first step of the accession sequence is presented as an example¹⁴. Prussia's agreement with Hesse-Darmstadt in 1828 had in itself not much direct value for Prussia, in financial terms it was even a substantial loss due to the short length of border between the two states. The agreement however had a strong impact on the other German states. One such

¹³The second section of VBDZ contains a wide range of archival documents relating to these negotiations between the states. Bavaria and Wuerttemberg participated in these discussions before they formed their own union; however, their agreement was the result of separate negotiations.

¹⁴The description of the externalities here is taken from Anonymous (2014)

externality was strategic since the agreement created an obstacle for further expansion of the just concluded union between Bavaria and Wuerttemberg, affecting their long-term outlook. Another, even more strongly political, externality was the pressure this treaty caused for the other Hessian states, in particular neighbouring Hesse-Cassel. The treaty explicitly called for Hesse-Darmstadt to use its political influence and dynastic relations to convince the neighbouring Hessian sovereignties to accede as well(VBDZ 379); Prussia especially wanted Hesse-Cassel to join(VBDZ 370) due to its geographic position between the two major Prussian territories. Once this happened in 1831, the combined tariff area would contain all trade routes between the south of Germany and the North Sea ports which represented the gateways to many important international markets. As a consequence the southern German states experienced a number of negative externalities, in particular financial ones, higher transit tariffs would reduce trade and therefore tax revenues, and a reduction in market access, since Prussia's control over trade routes affected the ability of these states to conclude reciprocal trade agreements with foreign nations.

The model starts with the decision of the agenda setter to open negotiations. It does not consider the timing of that particular step. In a dynamic version this decision would be triggered when the expected pay-off of the agenda setter will decrease from further waiting. In the early 1820's Prussia's financial situation was not as rosy, so the necessary financial outlays required were problematic. However by the middle of the decade this was no longer a constraint (Henderson, 1984). Now its expected pay-off was influenced by the total gain from the union and the externalities, which implied the price it had to pay to convince other states to join. While the first one didn't really change, the latter was the trigger in 1827. Bavaria and Wuerttemberg reached an agreement at that time, which not only made it more costly to convince those states but importantly raised the possibility of a

more wide-spread agreement between other German states. Such an agreement, like the *Mitteldeutscher Handelsverein* later on attempted to be, would have raised the reservation prices of most other states through a mitigation of coalition externalities, reducing Prussia's pay-off as a consequence.

4 Institutional Choice

Following Viner's (1950) definition, a customs union has three central characteristics: no tariff barriers between its members, a uniform external tariff and a predetermined revenue distribution scheme. This implies that a customs union is a particular form of (free) trade agreement, and therefore a possible outcome of the framework.¹⁵ Additionally, the revenue distribution scheme of a customs union usually involves some form of monetary transfer between member states. This corresponds well with the model, which incorporates the possibility of transferring utility between coalition partners in the transferable utility game underlying the pay-offs. In contrast to the bargaining structure is the institution form however no direct prediction of the model. Nevertheless it raises the question whether the development of this new institutional form is shaped by the underlying logic of the framework.

The theoretical model has the agenda setter determining the offers, and thereby membership terms, it makes to other states, which implicitly also gives the choice of the institutional structure to the agenda setter. Prussia had therefore the opportunity to choose the institutional form that maximized its payoff. The existence of negative externalities, demonstrated above in the context of the choice for sequential bargaining, implies that the agenda setter could capture the membership gains of the other states. The selected institutional form was therefore chosen by Prussia to maximize the payoff of the complete agreement as well as the negative externalities of the intermit-

¹⁵This is also directly noted by Aghion et al..

tent agreements.

Dumke (1994)'s thesis about economies of scale in customs administration relies on the existence of administrative savings, which are only feasible under a customs union. Such a reduction in administrative costs is the major advantage over regular free trade agreements. Both lead to a fall in direct revenues due to free trade over certain borders but only a full customs union allows to significantly reduce or even abolish customs controls on these borders. Dumke's evidence also demonstrates that the administration costs of German states were not negligible compared to customs revenues. For some of the smaller states the costs were so prohibitive that they hadn't introduced a full external border tariff system but relied on tolls and tariffs on the roads through their territory.

This advantage of a customs union exists because of the necessary enforcement of rules of origin regulations in free trade agreements. Member states of a free trade area can only uphold differences in tariff rates against third country producers if the enforcement of the rules of origin regulations at their borders is sufficiently strong. The relatively small size and complex, interwoven geographical positions of German states allowed for relatively cheap detours, so the savings through entering in the lower tariff rate FTA member state, forging the origin of the goods and then freely exporting into the higher tariff member state, easily outweighed the higher transport costs. This can be demonstrated using the preferential trade agreement between Hesse-Darmstadt and Baden in 1824. Hesse, which had strong budgetary problems, was running high tariffs for revenue purposes, while Baden, as a trading-oriented nation, had relatively low tariffs. This created two possibilities for foreign producers, for example a trader in Bavaria, who wanted to sell in Hesse-Darmstadt. He could travel directly to Hesse-Darmstadt from Bavaria, paying high tariffs on his goods. Or he could travel from Bavaria to Baden, paying low tariffs but only slightly higher travel costs, and then

enter Hesse-Darmstadt without further payments by masking the origin of his goods as Baden. One year later, Hesse-Darmstadt cancelled the treaty due to complaints about such smuggling and the inaction of Baden in this matter (Müller, 1984).

The importance of rules of origin regulations is strongly linked to the ability of individual free trade agreement member states to uphold different tariff rates against non-member states. This ability to set different rates than other member states, essentially the retention of a state's right to set its own tariff rates, has economic implications and can affect a state's general welfare. The agenda setter will select a free trade agreement if its payoff from capturing the welfare effects of other member states' deviations from the alternative customs union tariff rate outweighs the payoff from capturing the cost reductions of the potential customs union.

The importance of economies of scale in customs administration also provides evidence why Prussia acted as agenda setter, rather than Austria or even France. Using GIS-data for the historical borders at the time I calculated the length of borders with other German states that would become internal borders of a customs union in these cases. Prussia's value was approximately 3,180 km, Austria 1,197 km and for France 434 km. Additionally these values are biased against Prussia in more aspects. First France's border with German states, in particular Baden, consisted mainly of the river Rhine with consequently lower costs to administer it. Similarly Austria's borders with Saxony and Bavaria in large parts was mountainous, again implying comparatively lower costs to guard the border. Second, the calculation for Prussia excludes borders of enclaves, including Prussian ones and those within Prussia. However as indicated above, in many cases special arrangements were made for these already before the Zollverein. Another difference is that the number of neighbour states was substantially different, Austria

had three, France had four while Prussia had at least a dozen¹⁶. This indicates that Prussia needed a more widespread agreement with other German states in this regard.

This larger number of neighbours also reinforced a second consequence of a customs union, namely a larger impact on outside states. The uniform tariff rules make differential tariff preferences for neighbouring states less likely. This usually hurts border regions, who find themselves facing higher tariff and trade barriers to access either markets within the new customs union, and thereby affects the internal political economy. Additionally these new barriers might likely require a change in transport routes, affecting international market access as well. And finally a customs union is more likely than a free trade agreement to divert exports into other markets within the union, therefore hurting tariff revenues of neighbouring states. Prussia's choice of a customs union structure over a free trade agreement exerted stronger negative coalition externalities on multiple other states¹⁷, thereby increasing Prussia's pay-off in case of these states' accessions.

The Zollverein became the first international customs union because the cost reductions, which were possible due to the substantial length of borders between German states, outweighed the welfare gains from tariff deviations. These deviations would have been rather minor, since the Zollverein tariff, mirroring in this regard the previous Prussian tariff, was fairly moderate and an explicit compromise between the interest of industrializing and agricultural dominated member states. This effect was reinforced by the comparatively stronger impact a customs union structure had on potential further member states

¹⁶The numbers for France and Austria also include Prussia, while the exact number for Prussia depends on how enclaves and small principalities are counted.

¹⁷Direct examples of this effect are shown in Anonymous (2014).

5 Conclusion

Traditionally the economic history literature for the creation of the Zollverein focuses on the underlying reason rather than the structure of the formation process. This paper demonstrates that a game-theoretic approach can explain the observed developments, in particular the bargaining structure and institutional form. The central idea that shapes the process is the presence of coalition externalities, the effects intermediate agreements have on those states not involved. This concept allows to find a balance between individual factor explanations, like financial savings or international market access, and fully contingent descriptions, which do not provide a structural explanations. And it allows to widen the scope of relevant factors from purely financial administrative savings, traditionally the main explanation for the Zollverein, to the inclusion of important geographical, political and trade policy factors.

This paper demonstrates that the underlying theoretical framework fits the historical situation of the Zollverein very well, provides a categorisation of coalition externalities in this particular context, and explains two important characteristics of the formation process. The model however also has predictions for another aspect of this process, namely the sequence of accession into the customs union. The discussion of the bargaining structure already alludes to this. In a separate paper¹⁸ I build upon the framework outlined here and provide a thorough explanation of the observed accession sequence using a similar analytic narrative approach. In particular I demonstrate that this sequence indeed has the characteristics of the optimal sequence implied by the model. The main conclusion of that analysis, namely that the specific nature and role of coalition externalities determined each step of the accession sequence, reinforces the conclusion drawn about the importance of these

¹⁸This separation is due to reasons of length, an earlier working paper version contains both.

externalities in this paper.

The explicit nature of these externalities during the creation of the Zollverein, shown here and in that explanation of the accession sequence, differ somewhat from those of international trade negotiations in modern times. In the negotiations between German states these externalities were substantially more influenced by geographic considerations. The location of trade routes and the consequential impact on customs revenues as well as the physical control over these routes and the impact for international market access were much more shaped by the geographical conditions in the historical situation of the 19th century than they are today. This importance of geographical factors reinforced the relative size of coalition externalities, indicating that the latter were especially strong in this setting.

The Zollverein was a successful customs union, whose example allows us to draw conclusions for modern trade policy. It provides an example where an agenda setter uses a sequential approach to form a coalition and illustrates the importance of externalities, the effect a coalition has on non-participating states. It shows that regional agreements can be building blocks, but that for the successful conclusion of a global free trade agreement the agenda setter should have sufficient possibilities to exert negative coalition externalities during the formation process.

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Tables

Table 1: Summary Statistics about Zollverein members

State	Treaty Signature	Size	Border/Area	Population 1834
Prussia		5108.9	0.22	13690653
Hesse-Darmstadt	02/14/1828	152.7	1.06	758748
Hesse-Cassel	08/25/1831	166.2	1.13	640674
Bavaria	03/22/1833	1387.5	0.25/0.27*	4251118
Wuerttemberg	03/22/1833	354.3	0.48	1632781
Saxony	03/30/1833	271.9	0.59	1595668
Thuringia	05/10/1833	265.5	908478	
Baden	05/12/1835	278.4	0.75	1228024
Nassau	12/20/1835	85.5	0.67	373601
Frankfurt	01/02/1836	1.8	8	60000
Brunswick	10/19/1841	67.7	2.23	
Hannover	09/07/1851	698.7	0.58	
Oldenburg	03/01/1852	107.3	0.82	
*without/with Rheinpfalz				
<i>Thuringia</i> (territories as of 1858)				
Sachsen-Weimar		65.9	1.8	
Sachsen-Coburg-Gotha		36.5	2.52	
Sachsen-Meiningen		46.3	2.3	
Sachsen-Altenburg		23.2	2.68	
Reuss-Greiz		6.3	5.3	
Reuss-Juengere linie		52.3	3.46	
Schwarzburg-Rudolstadt		17.4	3.26	
Schwarzburg-Sondershausen		17.6	2.7	

Data taken from:

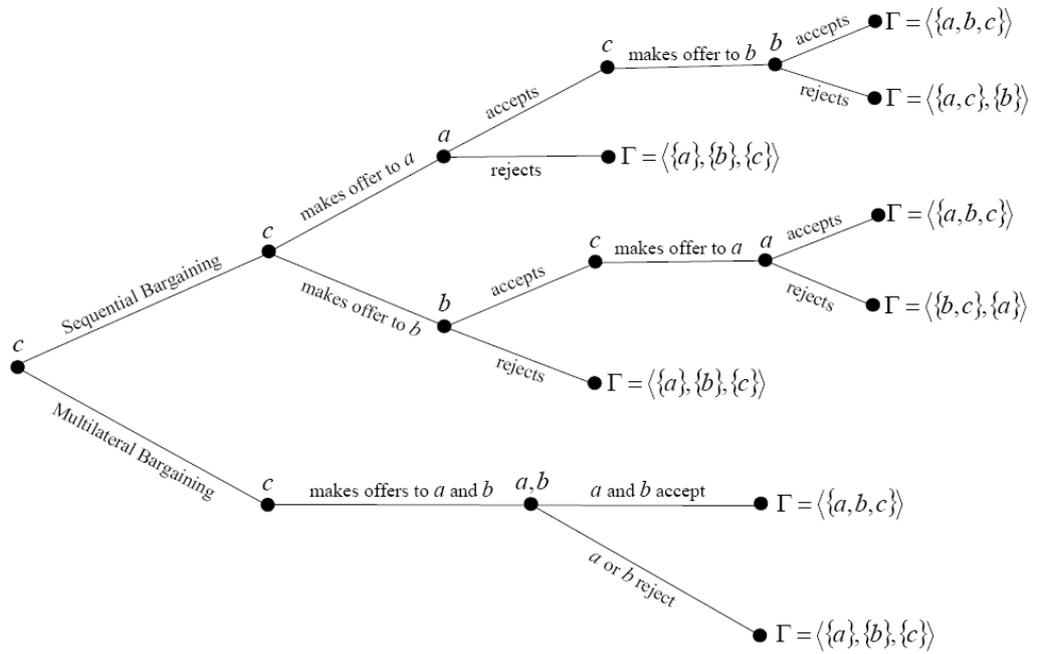
Dumke R., *German Unification in the 19th Century: the political economy of the Zollverein*, 1994

Henderson W.O., *The Zollverein*, 1984

Figures

The extensive form of the bargaining model for the three-country case is as follows:

Figure 1: Extensive form of the bargaining model



This is Figure 1, taken from Aghion, Antras and Helpman, 2007