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The Trade Effects of Safeguards: Evidence from Sweden

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Abstract

The ongoing trade conflict has received much attention, and many politicians, as well as economists, wonder what the consequences will be. To shed some light on what the trade effects might be, we empirically analyse the trade effects of a very similar trade conflict. This paper examines the trade effects of the US safeguard of 2002 on Swedish steel exports. While the main focus of the analysis is to estimate the indirect trade effects, we do estimate the direct trade effects for comprehensiveness. In contrast to the previous literature, we estimate the trade effects of the imposition and the termination of the safeguard separately. By separating the effects, we aim to broaden the understanding of how safeguards affect trade, not only when they come into force. Using a gravity model framework in combination with probability models, we find evidence of a direct effect when the safeguard came into force and no effect of the termination. The analysis of the indirect trade effects shows that Swedish steel exports deflected to third countries when the safeguard was imposed. The estimation shows that Swedish steel exports increased by 42 – 69 percentage points in the wake of the safeguard and that the exports to third countries declined by approximately 126 percentage points when safeguard was terminated.

Key words: Trade conflict, Safeguards, Protection measures, Gravity model, Swedish steel export

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List of abbreviations

AB	Appellate Body
AD	Anti-dumping
CVDs	Countervailing duties
DSB	Dispute Settlement Body
FTA	Free trade agreement
GATS	General Agreement on Trade in Services
GATT	General Agreement on Tariffs and Trade
HS	Harmonized system
ITC	US International Trade Commission
MFN	Most-favoured-nation
NAFTA	North American Free Trade Agreement
OLS	Ordinary Least Squares
TRIPS	Trade-Related Aspects of Intellectual Property Rights
TRQ	Tariff-rate quota
VERs	Voluntary export restrictions
WTO	World Trade Organization

1. Introduction

At the 1st of March 2018, President Donald Trump announced that the United States had the intention to raise its tariffs on steel and aluminium imports, and the order was signed one week later. Thus, the United States imposed tariffs of 25 per cent on steel and 10 per cent on aluminium, which applied to all countries. (National Board of Trade Sweden, 2019a). President Trump motivated the tariffs by claiming that the imports threatened the national security of the United States and could thereby impose higher tariffs permanently in line with Article XXI of the General Agreement on Tariffs and Trade (GATT). As expected, the tariffs touched up a wave of retaliation threats from trading partners and temporary exceptions were made for a small number of countries in order to calm the situation down.[1] However, when the exceptions reached their time limits, the EU, among other countries, imposed retaliatory tariffs on American products.[2] The economic consequences of the trade conflict could be large, and it is thus important from a policy perspective to understand what the implications may be. Since the conflict is still ongoing, it is hard to empirically estimate the costs since no reliable forward-looking models are around.[3] To increase our understanding of the consequences of protection measures and hopefully shed some light of what the consequences may be of the current conflict, we conduct a study on another, very similar conflict.

In 2002, the Bush administration imposed tariffs on steel products up to 30 per cent. The motivation was not linked to national security reasons but rather that the American steel industry was seriously injured by foreign imports (Hufbauer and Goodrich, 2003). Thus, the protection measure imposed was a so-called "safeguard", which unlike national security measures can only be imposed temporarily (WTO, 2019a). The safeguard was intended to last for four years, but the dispute settlement body (DSB) of the World Trade Organization (WTO) concluded that the safeguard was in breach with the United States' commitments under Article XIX of the GATT. The safeguard was therefore terminated in December 2003 after having been in force for 21 months.

[1] Temporary exceptions were made for Argentina, Australia, Brazil, Canada, Mexico, South Korea and the EU (National Board of Trade Sweden, 2019a).
[2] Beyond imposing countermeasures, the EU also imposed its own safeguard measures on steel and aluminium products in order to prevent that foreign steel would flood the EU market (National Board of Trade Sweden, 2019c).
[3] Computable general equilibrium models are commonly used to predict future outcomes of trade related issues. These models rely heavily on the assumptions made by the researcher, and their predictions may therefore be questionable (WTO and UNCTAD, 2012).

The consequences of protection measures can be studied from different angles, and we have chosen to focus on trade effects. While the trade effects of antidumping and other frequently used protection measures are well documented in the existing literature, less attention has been paid to the trade effects of safeguards. We have chosen to study the trade effects generated by the safeguard of 2002 on Swedish steel exports. Sweden is a well-suited country to study since it is a large steel exporter relative to its size and was targeted by the tariffs of 2002 and is currently targeted by President Trump's tariffs (National Board of Trade Sweden, 2019b). The main focus of the analysis is to investigate whether the safeguard led to a deflection of Swedish steel exports to third countries, i.e. the indirect trade effect, but we do estimate the direct effect as well for comprehensiveness. To the best of our knowledge, no previous research has covered the trade effects of safeguards. This paper makes a further contribution to the literature by estimating the trade effects of the imposition and the termination of the safeguard separately. We are thus of the belief that the paper will fill out a gap in the existing literature and hopefully, increase the understanding of the consequences of safeguards.

To estimate the direct and indirect trade effects of the safeguard, we use two data samples which both consist of Swedish aggregated exports flows of 94 unique 6-digit Harmonized System (HS) steel products over the period 1998-2008, but where the destination countries differ. The sample used to estimate the direct trade effect covers Swedish steel exports to the United States while the sample used to estimate the indirect trade effects covers Swedish steel exports to 77 third countries. In order to separate the trade effects of the imposition and termination of the safeguard, each sample is divided into two where the first sub-sample covers the transition from regular tariff rates to safeguard tariffs rates. The second sub-sample covers the transition back to regular tariff rates. Our analysis is based on the gravity model framework, which is the standard tool when empirically estimating equilibrium trade patterns and deviations from it (Feenstra, 2016). In the analysis of the indirect effect, we additionally estimate a probability model in order to study whether the safeguard affected the probability of exports to third countries.

The empirical analysis of the direct trade effect demonstrates that Swedish steel exports to the United States decreased when the safeguard was imposed. However, no direct trade effects can be identified when the safeguard was lifted. The probability estimations of the safeguard's indirect trade effects show evidence in line with our hypothesis; the imposition of the safeguard increased the probability of exporting to third countries while the termination of the safeguard had a reducing effect. The gravity analysis of the indirect effect shows that Swedish steel exports deflected to third

countries when the safeguard was in force, and thus that the safeguard generated indirect trade effects. When the safeguard was terminated, we find that the exports to third countries decreased substantially.

The paper is organised as follows. In section two, the legal framework and the trade effects of protection measures are outlined, and the section ends with an overview of the previous research on the subject. Section three outlines the trade dispute in question. Section four covers the empirical methodology, potential estimation issues and the data. The estimation results are reported and analysed in section five. Section seven concludes the paper.

2. Safeguard protection

This section starts with presenting the WTO rules concerning safeguard protection measures with the aim of giving an overview of the legal framework that applies. The section continues by describing potential trade effects of safeguards and ends with a brief overview of previous research on the subject.

2.1 What are safeguards and when can they be used?

Broadly defined, safeguard protection refers to "a provision permitting governments under specified circumstances to withdraw – or cease to apply – their normal obligations in order to protect (safeguard) certain overriding interests" (Hoekman and Kostecki, 2009, p. 413). To date, almost every trade agreement contains some form of safeguard provision with the rationale that the parties' governments want to be able to implement policies such that they can pursue noneconomic objectives, re-negotiate deals *ex-post* or protect themselves if "unfair" competition would to arise (Hoekman and Kostecki, 2009). In that sense, safeguard provisions function as both an insurance mechanism as well as a safety valve and without such, countries may refrain from signing trade agreements. (Hoekman and Kostecki, 2009) Besides, the inclusion of safeguard provisions may also result in deeper integration since the *ex post* flexibility could facilitate and encourage cooperation during the negotiations as well as ensuring governments that re-imposition of protection is possible if needed in future times (Hoekman and Kostecki, 2009).

The safeguard provisions embodied in the GATT can broadly be divided into two categories; provisions that allow for *temporary* suspension of obligations and provisions that allow for *permanent* suspension of obligations. Intuitively, this broad categorisation is based on the duration of the

suspension. As can be seen in Table 1, there are seven different safeguard provisions that allow for temporary suspension of obligations while three provisions allow for permanent suspension.

TABLE 1
SAFEGUARD PROVISIONS EMBODIED IN THE GATT

Instrument	Purpose	Regulation
	Provisions that allow for temporary suspension of obligations	
Anti-dumping (AD)	Measures taken into action to offset dumping that materially injures a domestic industry.	Article XI GATT and The Anti-Dumping Agreement
Countervailing duties (CVDs)	Measures taken into action to counter the effects of subsidies that materially injures a domestic industry.	Article VI GATT
Emergency protection (Safeguards)	Emergency measures taken to limit imports temporarily, with the aim of safeguarding domestic industries	Article XIX GATT
Balance of Payments	Import restrictive measures taken into action for balance-in-payments reasons.	Articles XII and XVII:b GATT; Article XII GATS
Infant industries protection	Measures taken to protect infant industries in developing countries.	Articles XVIII:a and XVIII:c GATT.
General waivers	Allows members to request a suspension of obligations (requires formal approval)	Article IX WTO
Special safeguards	Measures taken into action to offset sudden increases in imports that injure domestic producers of agricultural, textile and/or clothing products	The Agreement of Agriculture and Textiles and Clothing
	Provisions that allow for permanent suspension of obligations	
General exceptions	Measures takes to achieve non-economic objectives such as safeguard public morals, and/or human, animal or plant life or health	Articles XX GATT; XIV GATS
National security	Allowment of tariff concessions to protect national security	Articles XXI GATT; XIV*bis* GATS; 73 TRIPS
Re-negotiation of schedules	Allowment for withdrawal of concessions	Articles XXVIII GATT; XXI GATS

Source: Hoekman and Kostecki (2009)

Emergency protection, commonly known as "safeguards" allows for restrictions of imports of a product temporarily when the imports cause or threat to cause serious injury to a domestic industry

(WTO, 2019b).[4] The rules for application of safeguards are regulated in Article XIX of the GATT, which states that quantitative import restrictions and/or tariffs higher than the bound rates can be imposed when certain conditions are met. In order to impose safeguards, a detailed investigation must be conducted and show that "(i) unforeseen developments (ii); resulting from the effects of obligations incurred by a contracting party […] (iii); [lead] to increased imports (iv); [which] cause or threat [to] serious injury domestic producers" (Hoekman and Kostecki, 2009, p. 423).

Due to the stringent conditions needed for application, safeguards have historically been an infrequently used measure (WTO, 2019b). Prior to the Uruguay round in 1994, many governments preferred to use voluntary export restraints (VERs) instead of safeguards (Hoekman and Kostecki, 2009). The two measures were close substitutes, and with much less stringent conditions for VERs, governments rarely chose to impose safeguards. VERs got, however, prohibited during the Uruguay round and since then has the use of safeguards been used more often. Still, safeguards are less frequently used compared to other safeguard provisions such as antidumping (AD) and countervailing duties (CVDs). One explanation is that, in contrast to AD and CVDs, safeguards must follow the principle of most-favoured-nation (MFN), which means that the import restrictions must be irrespective of the source (WTO, 2019a).[5] The requirement of MFN may make safeguards less attractive, especially when the harmful imports primarily originate from one specific country. The possibility exists though to exclude products originating from a free trade agreement (FTA) partner since Article XXIV of the GATT 1994 states that departures from the MFN principle can be made in order to facilitate deep integration of FTAs (UNCTAD, 2003). Furthermore, Article XIX GATT also prohibits safeguards from being used against developing countries that are WTO members and whose import shares are less than three per cent (Hoekman and Kostecki, 2009).

The provisions that have not been mentioned differ in terms of regulation, application and purpose compared with safeguards. A comparison between safeguards and these provisions is therefore not of any significant interest for this paper and hence lies beyond the scope. For further reading about the various safeguard provisions, see for example Hoekman and Kostecki (2009) and Finger (1996).

[4] To be consistent with the existing literature, we will henceforth refer to emergency protections as "safeguards".
[5] The principle of most-favoured-nation refers to the WTO rule of non-discrimination, which says that a country cannot treat a product originating from one country less favourably than a like product from another country (Hoekman and Kostecki, 2009).

2.2 Trade effects of safeguards

The trade effects brought on by safeguards can be divided into direct and indirect effects (Chandra, 2016). The direct path is reduced exports from the targeted country. As intended, the higher tariffs rates will make it less profitable for the firms of the targeted country to export to the now safeguarded market. The reduced market access will, hence, result in reduced export growth, which is intuitively negative from the standpoint of targeted firms. Depending on the importance of this now lost market, the negative direct effect could be substantial and significantly hurt the firms whose products are being subject to the safeguard.

Having lost market access to the imposing country, the firms of the targeted country may want to seek other export destinations. The re-rotation or deflection of exports to third countries constitutes the indirect effect of the safeguard. To which extent a firm can deflect its exports depends on several factors. Highlighted by Roberts and Tybout (1997), the sunk cost of entering a new market is a major determinant of whether a firm decides to re-route their exports or not.[6] If the costs of entering a market exceed the expected profit from entering it, no profit maximising firm will choose to enter. However, a firm may come to change its opinion in the light of a safeguard: the entry cost that has previously been viewed as too high might be acceptable after the firm has lost the market of the imposing country. Since sunk entry costs are a major determinant of trade, it is reasonable that an already established trade relation or an FTA partnership with third countries will ease the deflection, since it lowers the entry cost.

In addition, macroeconomic conditions may also influence how easily deflection can be made. For instance, if the safeguard is imposed in a slowdown of the business cycle, it might be hard(er) to find new importers for targeted firms since industrial production will go at low speed (Bown and Crowley, 2006a). Also, currency exchange rates may impact deflection possibilities. A weakening currency of the targeted country relative to the importing country's currency is favourable for deflection since it will be cheap to import from targeted firms (Campa, 1993). Another crucial factor for deflection is the incentives of deflection. If the injury inflicted by the safeguard is substantial (direct trade effect), the incentives for deflection (indirect trade effect) increase. If a quick re-rotation can be made, and if the "new" export destinations can substitute for the lost market, the indirect effect might up-balance the direct effect – at least to some extent. However, if

[6] Sunk entry cost can be everything from costs depicting from market inquiries to costs associated with seeking export licenses. The term "sunk" refers to cost that cannot be recovered.

the injury inflicted by the safeguard is minor, there might not be enough incentives to seek other export destinations, and the injury could, therefore, be greater in the end.

So far, we have not covered what the trade effects will be when the safeguard is lifted. Once again, the sunk entry cost comes into play; if the costs of re-entering the previously safeguarded market are substantial, firms may refrain from returning to the market and instead continue to export to the third markets. Since the entry cost of the third market has already been paid, firms may find it economically unjustified to switch back (Roberts and Tybout, 1997). However, if no deflection took place under the period when the safeguard was in force, it is reasonable to expect that exports to the previously safeguarded market will resume to the same extent as before.

To summarise, the net effect of safeguards for a targeted country is hard to predict in beforehand. What we can say though is that safeguards should be expected to have direct trade effects and the greater the magnitude, the more likely it will also generate indirect trade effects. Whether the safeguard will generate indirect trade effects is less clear since it depends on several factors such as the timing of the business cycle and how large the sunk costs of entering third markets are.

2.3 Previous research on protection measures

While a large share of the existing research literature has been devoted to political economy issues that arise from trade protection, a growing empirical literature has under the past three decades started to lay out the foundation of an understanding of the trade effects generated by protection measures.[7] Almost all research that empirically investigates trade effects concerns antidumping, and far less attention has been paid to other protection measures. However, since AD duties as well as safeguards are import restrictive, the literature on antidumping is highly relevant for this study.

The earliest papers that focus on trade effects are by Staiger and Wolak in 1994 and by Prusa in 1997. Both papers examine the impact of US antidumping during the '80s on imports from targeted countries. Prusa (1997) finds that the AD duties had a substantial direct effect while Staiger and Wolak (1994) find evidence that even the investigations deterred imports. The early work of Staiger and Wolak (1994) and Prusa (1997) paved the way for further research, but in contrast to these studies, much of the later research has shifted focus from the direct trade effect of protection measures to the indirect effects.

[7] Papers that focus on the political economy of safeguard measures, see for example Baldwin (1992), Francois and Baughman (2003), Nelson (2006) and Read (2005).

In a widely cited paper, Bown and Crowley (2006a) construct a theoretical model based on Cournot competition to explain the trade effects generated by protection measures. To test their model, they apply it on Japanese export data to 37 countries between 1992 and 2001 and study whether US AD duties deflected Japanese exports. By exploiting substantial variation across products, they find evidence of deflection of Japanese exports to third countries up to seven per cent under the period that the AD was in force. In another paper, Bown and Crowley extended the analysis by investigating how the US antidumping affected Japanese exports to the EU under the same period (Bown and Crowley, 2006b). Applying the same model as they developed earlier, they document a sizable trade deflection of Japanese exports to the EU. They are also able to document that the deflection generated terms-of-trade externalities on the EU.

With China being a frequent target of protection measures, it is no wonder that an extensive share of the literature focuses on how it affects Chinese trade. Using the model of Bown and Crowley (2006a), Bown and Crowley (2010) and Chandra (2016) study how protection measures against China affects Chinese trade with third countries. While Bown and Crowley (2010) limit their study to only concern the effects of antidumping, Chandra (2016) covers countervailing duties and safeguards as well. While Bown and Crowley (2010) do not find any evidence of indirect effects on Chinese exports, Chandra (2016) finds the opposite. Using detailed product-level data on Chinese exports, Chandra (2016) finds evidence of an increased growth of Chinese exports to third countries and that the trade deflection was mainly on the intensive margin.[8]

Papers more similar to this in terms of the empirical methodology are Vandenbussche and Zanardi (2010) and Egger and Nelson (2011). While most studies use data on product-specific levels, Vandenbussche and Zanardi (2010) study the trade effects of antidumping on aggregate levels. Using a gravity model framework, they demonstrate that antidumping has a substantial chilling effect on imports. Having established a negative direct trade effect on aggregated imports, they extend the analysis by investigating whether the effect is heterogeneous across sectors. Dividing their data on a sectoral basis and subtracting each sector from the sample one at the time, they conclude that the negative direct trade effects are predominantly driven by broad sectors such as steel, chemicals, textiles and agriculture (Vandenbussche and Zanardi, 2010). Quite similar is the study of Egger and Nelson (2011); using aggregated data and a gravity model framework, they

[8] The intensive margin of trade refers to the value or volume of existing trade flows. Thus, Chandra (2016) finds that existing Chinese exports flows to third countries increased in the wake of the safeguard measures and not that new export flows to third countries were created.

study the trade effects of AD as well as AD investigations. The results are similar to those of Vandenbussche and Zanardi (2010); AD has a significant direct trade effect on aggregated imports, and they find no indication of an effect of AD investigations. To test the robustness of the results, they extend the analysis by investigating whether the effects of antidumping differ between product groups and by the economic status of the exporting country. While they cannot demonstrate that economic status matter, they do find that direct trade effects are largest for the iron and steel products.

To the best of our knowledge, no paper has addressed the direct and indirect trade effects of safeguards solely. We have also not been able to find any paper that analyses the effect of protection measures on Sweden. While our research question is similar to Bown and Crowley (2006a; 2006b; 2010) and Chandra (2016), our empirical methodology resembles the one of Vandenbussche and Zanardi (2010) and Egger and Nelson (2011). We are therefore of the belief that this study will contribute to the literature and hopefully broaden the understanding of safeguards.

3. Description of a particular case of safeguards: The US imposition of steel tariffs in 2002

Steel has always had a high value to the society, and its importance is reflected in the immense growth of steel production; 189 million tons of crude steel was produced globally in the 1950s, and the figure has almost ten doubled by 2018 (World Steel Association, 2019).[9] The steel industry is a complex sector which is closely linked to the world economy. Alongside with the large economic value that is associated with steel production and with over 30 per cent of the steel being traded internationally, it is hardly surprising that many trade disputes concern steel (World Steel Association, 2019).

One such dispute emerged in the early 2000s. The American steel industry had long been in distress when it culminated under President Bush's regime in 2001. The American government viewed the situation as an emergency, and which called for action. An investigation was initiated in 2001 where the US International Trade Commission (ITC) established that 16 steel products "[were] being imported into the United States in such increased quantities that they were a substantial cause of serious injury or threat of serious injury to US steel producers" (Hufbauer and Goodrich, 2003, p. 1). Since the intention was to impose safeguards, the ITC did not need to demonstrate if these steel

[9] 1,890 million tons where produced globally by 2018 (World steel Association, 2019).

products were being sold unfairly, which would have been a requirement if AD or CVDs were to be used. President Bush's response came in March 2002 when he sanctioned that safeguards would be imposed for 14 out of the 16 steel products that ITC had found injuring (see Table 2). Plate, certain types of flat steel products, hot-rolled bars, and cold-finished bars were subject to 30 per cent tariffs while other types of steel products were subject to up to 15 per cent tariffs. Besides these tariffs, President Bush also imposed a tariff-rate quota (TRQ) of 30 per cent in excess of 5.4 million tons of imported steel slab products (Francois and Baughman, 2003). See Table 2 for more details concerning the tariff rates.

TABLE 2
STEEL PRODUCTS SUBJECT TO THE US SAFEGUARD OF 2002

Plate	30 %
Hot-rolled sheet	30
Cold-rolled sheet	30
Coated sheet	30
Tin mill products	30
Hot-rolled bar	30
Cold-finished bar	30
Rebar	15
Certain welded tubular products	15
Carbon and alloy fittings and flanges	13
Stainless steel bar	15
Stainless steel rod	15
Stainless steel wire	8
Slab	30 % in excess of quota of 5.4 million tons

Source: Francois and Baughman (2003)

In line with Article XIX of the GATT, the safeguard was imposed on a non-discriminatory basis and thus applied to all countries. Products originating from Canada, Mexico, Jordan and Israel were, however, excluded from the remedies since the countries had free trade agreements with the United States (Govinfo, 2019).[10] As article XIX of the GATT further states, safeguards cannot apply to developing countries that are WTO members and whose import shares are less than three per cent (Hoekman and Kostecki, 2009). For that reason, countries that qualified to these premises were also excluded from the safeguard.

The response from the outside world came quickly. A large number of countries launched legal proceedings against the United States to the WTO DSB with the claim that the US safeguard had no economic justification. Objective observers argued that although the American steel industry

[10] Canada and Mexico were both member of the North Atlantic Free Trade Agreement (NAFTA) and Jordan and Israel have separate FTAs with the United States

was in distress, the distress was not trade-related. The general view was instead that the steel tariffs were driven by political objectives (Hufbauer and Goodrich, 2003). Based on these arguments, the US safeguard was seen as being unjustified and hence violating the rules of safeguards. The EU was one of those who filed claims to the WTO DSB and imposed its own protection measures to protect its members from foreign steel flooding the EU market. Amongst with other countries, the EU also threatened to retaliate by imposing countermeasures against sensitive American products. After receiving the threats, the Bush administration announced that they would make certain product exceptions – exceptions just enough to prevent a foreign backlash (Hufbauer and Goodrich, 2003).[11] The exceptions that were made calmed the situation down, and the EU never realised its threats of countermeasures.

In June 2003, the DBS Panel concluded that the US safeguard was inconsistent with at least one of the requirements stated in Article XIX of the GATT and requested that the United States terminated the safeguard subject to the dispute. The United States appealed to the Appellate Body (AB), and the process continued. The final verdict came in November 2003 when the AB upheld the Panel's conclusion that the US safeguard was in breach with Article XIX of the GATT (WTO, 2003). In December 2003, President Bush announced that the United States would terminate the safeguard measures subject to the dispute[12].

4. Empirical approach

4.1 Empirical models

To assess the direct and indirect effects of the safeguard, a gravity analysis is applied. The gravity equation has since its introduction by Tinbergen (1962) been widely used to analyse determinants of bilateral trade flows, and its theoretical foundation has been further developed and justified by Anderson (1979), Bergstrand (1985, 1989) and Anderson and Van Wincoop (2003) amongst others. The intuition of the gravity model is to estimate the counterfactual outcome, which in our case, is what the export flows would have been in the absence of the safeguard. Given the proven stability

[11] One such exceptions was imports of so-called "special steel products" (National Board of Trade Sweden, 2019d).
[12] The conflict of 2002 resembles the conflict of today in many aspects. In 2002, the protection measure used was safeguard tariffs, while the current measure is national security-motivated tariffs, but the products subject to the tariffs are much the same. Another similarity is that much suggest that it is political objectives that are the actual motivation behind both interventions. By these similarities, we believe that by studying the trade effects of the steel conflict of 2002, we can shed some light of what Sweden can expect from current trade conflict in terms of trade effects.

and power to explain bilateral trade flows, we employ an augmented gravity equation to estimate the trade effects of the US safeguard on Swedish export flows (WTO and UNCTAD, 2012).

In the analysis of the indirect trade effects of the safeguard, we additionally estimate a probability model. It allows us to predict the probability of the indirect trade the safeguard had on Swedish steel exports to third countries. Combined with the gravity estimations of the indirect effects, we can provide a comprehensive analysis of the safeguard's indirect impact on Swedish steel exports.

While our primary focus is the indirect effects of the safeguard on Swedish steel exports, we begin the empirical analysis by estimating the direct effect before turning to the indirect effects. The section, therefore, starts by outlining the empirical model of direct effect and then proceeds to outline the models of the indirect effect.

4.1.1 Gravity model of the direct effects

We begin the analysis by estimating the direct effect of the safeguard on Swedish steel exports to the United States. For this purpose, we use an augmented gravity model. To separate the direct effect of the imposition and the termination of the safeguard, we divide the sample into two and estimate different gravity equations for each.[13] The first sub-sample covers the period of January 1998 – December 2003 and thus captures the transition from regular tariff rates to safeguard tariff rates. The second sub-sample covers the period of June 2002 – December 2008 and covers the transition back to regular tariff rates. The estimated gravity equations are:

$$EXP_{SWE\text{-}US,t} = exp[\beta_0 + \beta_1 lnMASS_{SWE,US,t} + \beta_2 lnX\text{-}RATE_{SWE,US,t} + \alpha SAFEGUARD_t] \varepsilon_{SWE,US,t} \quad (1)$$

$$EXP_{SWE\text{-}US,t} = exp[\beta_0 + \beta_1 lnMASS_{SWE,US,t} + \beta_2 lnX\text{-}RATE_{SWE,US,t} + \rho NO\ SAFEGUARD_t] \varepsilon_{SWE,US,t} \quad (2)$$

where equation (1) is estimated for the sub-sample covering January 1998 – December 2003 and equation (2) is estimated for the sub-sample covering June 2002 – December 2008. Common to the two equations is the dependent variable, $EXP_{SWE\text{-}US,t}$, which denotes Swedish aggregated export flows of 94 unique 6-digit HS steel products to the United States at time *t*. Provided by the gravity framework is the variable of economic mass ($MASS_{SWE,US,t}$) which measures the sum of Swedish and American GDP at time *t*. According to the gravity theory, trade is positively correlated with economic size, and hence we expect β_1 to be positive for both specifications. Highlighted by Bown and Crowley (2006a) and Campa (1993), macroeconomic conditions could potentially influence the

[13] The sample used to estimate the direct trade effect of the safeguard covers Swedish steel export flows to the United States. The sample is further described in section 4.3.

trade effect. We, therefore, include $X\text{-}RATE_{SWE,US,t}$ as a proxy for macroeconomic conditions. The variable measures the exchange rate between SEK and USD, and since a weak SEK relative to USD is favourable for an American importer, we expect to find a positive coefficient of β_2 for both specifications. The last variable that is common for the two equations is $\varepsilon_{SWE,US,t}$, which denotes the error term.[14]

What differs between the two equations is the variable of interest. For equation (1), the variable of interest is $SAFEGUARD_t$, which is a dummy variable taking the value of unity when the safeguard is in force, and zero otherwise. Since the safeguard reduces the market access to the United States, we expect to find α to be negative. For equation (2), the variable of interest is $NO\ SAFEGUARD_t$, which is a dummy variable taking the value of unity after the safeguard is terminated, and zero otherwise. The termination of the safeguard will increase the market access to the United States, so a possible scenario is that the exports resume to the same levels as before the safeguard. Another scenario is that the costs of re-entering the American market are so large that Swedish exporters refrain from re-entering. Our expectations are, therefore, to find ρ to take a positive sign or to be insignificant.

As can be noted, the two equations lack several of the traditional gravity variables. Apart from economic mass, the second cornerstone of the gravity model is the geographical distance between the trading countries. Since the sample used to estimate the direct effect of the safeguard only covers Swedish steel export flows to the United States, we are unable to control for bilateral distance. It is because the variable would have no variation and hence get omitted. For the same reason, we are unable to control for other traditional variables such as landlocked, shared border and FTA partnership. Due to this limitation, the estimation results of equation (1) an (2) should be treated with caution.

4.1.2 Probability model of the indirect effects

The first step of the analysis of the indirect trade effect is to estimate whether the safeguard affected the probability of exporting to third countries. Similar to the direct effect estimations, we divide the sample into two in order to separate the indirect effect of the imposition and the termination of the safeguard.[15] The same division applies here, where the first sub-sample covers the period of

[14] The equations are estimated with robust standard error in order control for heteroscedasticity.
[15] The sample used to estimate the indirect trade effects of the safeguard covers Swedish steel exports to 77 third countries. The sample is further described in section 4.3.

January 1998 – December 2003 and thus captures the transition from regular tariff rates to safeguard tariff rates. The second sub-sample covers the period of June 2002 – December 2008 and covers the transition back to regular tariff rates. The link function is logit and the estimated probability equations are:

$$P(export) = \tau_0 + \tau_1 lnMASS_{SWEjt} + \tau_2 lnDIST_{SWEj} + \tau_3 LANDLOCK_j + \tau_4 BORDER_{SWEj} + \\ + \tau_5 FTA_{SWEjt} + \theta SAFEGUARD_t + \gamma_t \quad (3)$$

$$P(export) = \tau_0 + \tau_1 lnMASS_{SWEjt} + \tau_2 lnDIST_{SWEj} + \tau_3 LANDLOCK_j + \tau_4 BORDER_{SWEj} + \\ + \tau_5 FTA_{SWEjt} + \delta NO\ SAFEGUARD_t + \gamma_t \quad (4)$$

where equation (3) is estimated for the sub-sample covering January 1998 – December 2003 and equation (4) is estimated for the sub-sample covering June 2002 – December 2008. The independent variable of equation (3) and (4) is binary and stated as follows:

$$\text{export} = \begin{cases} 1 \text{ if Swedish steel exports to country } j > 0 \text{ at time } t \\ 0 \text{ if Swedish steel exports to country } j = 0 \text{ at time } t \end{cases}$$

Provided by the gravity framework are the independent variables of economic mass ($MASS_{SWEjt}$) and bilateral distance ($DIST_{SWEj}$). These variables denote the economic mass of Sweden and country j at time t and the bilateral distance between Stockholm and country j's capital, respectively. As described in section 4.1.1, trade is assumed to be a positive function of economic mass, and we expect to find a positive sign of τ_1 for both specifications. Bilateral distance is a proxy for trade costs, and we thus expect to find a negative sign of τ_2 for both specifications. Further included independent variables are $LANDLOCK_j$ and $BORDER_{SWEj}$. Both variables are dummies and where $LANDLOCK_j$ controls for whether the importing country is landlocked and $BORDER_{SWEj}$ controls for whether Sweden and country j have a common border. While being landlocked is a geographical factor known to increase transportation costs, a shared border is assumed to decrease transportation costs. We thus expect τ_3 to be negative and τ_4 to be positive for both specifications. Given that the mechanism driving the indirect effect might be related to sunk entry costs, we include the variable FTA_{SWEjt} as a proxy for trade facilitation. The variable is a dummy taking the value of unity if there is an FTA partnership between Sweden and country j at time t, and zero otherwise. We expect that an FTA partnership has a positive effect on deflection and thus that τ_5 should take a positive sign.

Once again, what differs between the two equations is the variable of interest. The variable of interest of equation (3) is $SAFEGUARD_t$, which is a dummy variable taking the value of unity when the safeguard is in force, and zero otherwise. Since the safeguard reduces access to the American market, we expect to find that the safeguard increases the probability of Swedish firms exporting steel to third countries. $NO\ SAFEGUARD_t$ is the variable of interest of equation (4). It is a dummy variable that takes the value of unity after the safeguard is terminated, and zero otherwise. Since the access to the American market increases by the termination of the safeguard, we expect to find a reduced probability of exports to third countries or that the termination did not affect the probability. Hence, the sign of δ depends on how the Swedish exporters regard the markets after the termination of the safeguard.

In contrast to how we controlled for macroeconomic conditions in the analysis of the direct effect, we now include year-by-month fixed effects (γ_t) instead. The year-by-month fixed effects will capture and control for macroeconomic conditions and, therefore, is our previous proxy for macroeconomic conditions, $X\text{-}RATE_{SWEjt}$, redundant and hence excluded from equation (3) and (4).

4.1.3 Gravity model of the indirect effects

The second and last step of the analysis of the indirect effects of the safeguard is to estimate an augmented gravity model. We use the same division of the sample as for the probability estimations, where the first sub-sample covers the period of January 1998 – December 2003 and the second sub-sample covers the period of June 2002 – December 2008.[16] The estimated gravity equations for the indirect effect analysis are:

$$EXP_{SWEjt} = exp[\pi_0 + \pi_1 lnMASS_{SWEjt} + \pi_2 lnDIST_{SWEj} + \pi_3 LANDLOCK_j + \pi_4 BORDER_{SWEj} + \\ + \pi_5 FTA_{SWEjt} + \eta SAFEGUARD_t + \gamma_t]\ \varepsilon_{SWEjt} \quad (5)$$

$$EXP_{SWEjt} = exp[\pi_0 + \pi_1 lnMASS_{SWEjt} + \pi_2 lnDIST_{SWEj} + \pi_3 LANDLOCK_j + \pi_4 BORDER_{SWEj} + \\ + \pi_5 FTA_{SWEjt} + \varphi NO\ SAFEGUARD_t + \gamma_t]\ \varepsilon_{SWEjt} \quad (6)$$

where equation (5) is estimated for the sub-sample covering January 1998 – December 2003 and equation (6) is estimated for the sub-sample covering June 2002 – December 2008. The independent variables are the same as of the probability specifications, and we will therefore not

[16] The division enables us once more to distinguish between the indirect trade effects of the imposition and the termination of the safeguard.

describe these variables once more. The dependent variable of equation (5) and (6) is EXP_{SWEjt}, which denotes Swedish aggregated export flows of 94 6-digit HS steel products to third countries (j) at time t. In similar to the probability equations, macroeconomic conditions here are controlled for by year-by-month fixed effects (γ_t). Lastly, ε_{SWEjt} denotes the error term.[17]

The variables of interest are the same as of the probability specifications. $SAFEGUARD_t$ is the variable of interest of equation (5), and we expect η to take a positive sign since the safeguard is assumed to generate deflection of exports to third countries. $NO\ SAFEGUARD_t$ is the variable of interest of equation (6), and for the same reasons discussed in section 4.1.2, we expect φ to be insignificant or to take a negative sign.

4.2 Potential estimation issues

To investigate the direct and indirect trade effects of the US safeguard of 2002 on Swedish steel exports, we base the analysis mainly on the gravity model of trade. While the model has proven to be a powerful tool to explain bilateral trade flows, there are some issues that need consideration. The main issue concerns the form of the gravity equation. Due to its non-linear form, linear estimation models such as Ordinary Least Squares (OLS) require that the equation is log-linearized. A log-linear form is problematic for two reasons. First, in the presence of heteroscedasticity, a log-linear form of the gravity equation will yield biased estimates since the transformed error term will likely correlate with covariates (Santos Silva and Tenreyro, 2006). Second, zero observations will get dropped since the log of zero is not defined (WTO and UNCTAD, 2012). If not taken care off, these issues yield inconsistent estimates, and we use for that reason a Poisson estimator, which allows the gravity equation to be non-linear.

Omitted variable bias is another potential source of inconsistency. To control for omitted variables, a comprehensive set of fixed effects would be appropriate (Angrist and Pischke, 2009). We are, however, unable to include importer fixed effects since the models do not converge when we control for such. The inability of accounting for importer time-invariant factors is a weakness of the analysis since unobserved heterogeneity may not be controlled for. However, we do include year-by-month fixed effects in order to filter out macroeconomic conditions that might affect the trade effects. For the analysis of the direct trade effect, the small sample and lack of variation

[17] Both equations are estimated with robust standard error in order control for heteroscedasticity.

restrict us from controlling for bilateral distance and other covariates. Another weakness of the direct effect analysis is that we do not control for any fixed effects.

4.3 Data

To estimate the direct trade effects of the safeguard, we have constructed a dataset of monthly Swedish steel export flows to the United States over the period 1998-2008.[18] The steel export flows consist of 94 unique 6-digit HS steel products that have been aggregated (see Table 1 and A1 for specific products and HS codes). To estimate the indirect trade effects of the safeguard, an identical dataset has been constructed but where the importers are 77 third countries (see Table A2 for a list of the included partner countries).[19] The export flows of each product are in many cases extremely small, and we have for that reason chose to aggregate the flows in line with Vandenbussche and Zanardi (2010) and Egger and Nelson (2011). The export data are collected from the Eurostat database, and the 6-digit HS codes have identified by the US Federal Register and the Global Safeguard database of the World Bank. A list of the independent variables and their sources is found in section A3 of the appendix.

As previously mentioned, each data set has been divided into two sub-samples, where the first sub-sample consists of observations between January 1998 and December 2003 and the second sub-sample consists of observations between June 2002 and December 2008. The descriptive statistics of each sample and their respective sub-samples are seen in Table A4. While the sample of the direct effect consists of neither zero nor missing values, the indirect sample consists of 21 zero observation and 1 746 missing observations (see Table A4). We interpret the missing observations as no export was conducted and have, for that reason replaced the missing observation with zeros.

[18] While import data often are more reliable, data limitations have restricted us to base the study on export data.
[19] The selection of the 77 third countries is based data availability of independent variables.

5. Empirical results

5.1 Empirical results of the direct effects

The estimation results of the direct effect are seen in Table 3. We begin to report the estimates of the safeguard's impact on Swedish steel export to the United States when it came into force, which are seen in column (1). The first variable is economic mass. The coefficient is insignificant but shows as expected, a positive sign. The same goes for our proxy for macroeconomic conditions, $X\text{-}RATE_{SWE,US,t}$, which coefficient is insignificant. For this specification is $SAFEGUARD_t$ the variable of interest. The coefficient shows the expected sign and is significant on a five per cent level. The estimate implies that the imposition of the safeguard led to a reduction in Swedish steel exports to the United States by approximately 22 percentage points.[20]

Column (2) reports the estimated effect of the transition back to regular tariffs rates. The coefficient of economic mass takes the expected sign and is significant on a one per cent level. In line with the theory of the gravity model, this finding suggests that economic mass is positively correlated with the Swedish-American trade. In similarity to the finding of column (1), the coefficient of our proxy for macroeconomic conditions is insignificant. The variable of interest of this specification is $NO\ SAFEGUARD_t$. The coefficient is insignificant and implies that the termination of the safeguard generated no direct trade effects. That is, we cannot find evidence in support of the termination generated direct trade effects on Swedish steel exports.

To summarise, the analysis shows evidence in support of a negative direct trade effect when the safeguard came into force. Our estimate shows that Swedish steel exports to the United States decreased by approximately 22 percentage points in the wake of the safeguard. We want to emphasise though that one should not put too much weight on this finding in terms of magnitude since we do not test the robustness of the result. As for the direct trade effect of the termination, the analysis identifies a null effect of the termination. This implies that Swedish steel exports to the United States did not react to the termination of the safeguard. Once again, one should bear in mind that the sample used to estimate the direct trade effects is extremely small and that it only covers one-way trade between two countries. This limits us from including desired variables, and the estimates are likely inconsistent since we do not control for fixed effects. With that said, we are

[20] To interpret the percentage change in trade value due to a dummy switching from 0 to 1, the following formula should be applied: percentage change=(exp(coeff)-1)*100

satisfied by having demonstrated some evidence of a negative direct trade effect generated by the safeguard.

TABLE 3
GRAVITY ESTIMATIONS OF THE DIRECT TRADE EFFECTS OF THE US SAFEGUARD

	January 1998-December 2003	June 2002-December 2008
	(1)	(2)
	Poisson	Poisson
VARIABLES	$EXP_{SWE\text{-}US,t}$	$EXP_{SWE\text{-}US,t}$
$lnMASS_{SWE,US,t}$	0.280	2.532
	(0.623)	(0.003)
$lnX\text{-}RATE_{SWE,US,t}$	0.163	-0.807
	(0.543)	(0.177)
$SAFEGUARD_t$	-0.200	
	(0.0027)	
$NO\ SAFEGURD_t$		0.248
		(0.142)
Constant	1.164	-68.89
	(0.944)	(0.009)
Observations	72	79

P-values in parentheses

5.2 Empirical results of the probability estimations of the indirect effects

We now turn to the estimation results of the probability analysis of the indirect effects of the safeguard. We begin to report the estimation results of the imposition of the safeguard, which are seen in the first panel of Table 4. The baseline specification yields no significant coefficients, which suggests that none of the variables affected the probability of exporting to third countries (see column 1). To test the robustness, we estimate the same equation but instead use a Probit estimator, which in contrast to Logit assumes non-linearity. The Probit estimator does not allow for fixed effects, so we control for macroeconomic conditions by including the variable $X\text{-}RATE_{SWEjt}$ as a proxy. The results are seen in column (2). The Probit estimation shows significant coefficients of economic mass, distance, FTA partnership and the safeguard on a five to ten significance level. While we cannot interpret the magnitude of the coefficients, the estimates imply that the probability of exporting to third countries increased with a larger economic mass, an FTA partnership and the imposition of the safeguard while the probability decreased with distance.[21] Focusing on the variable of interest, the positive and significant coefficient of $SAFEGUARD_t$ provides evidence in favour of our hypothesis that the imposition of the safeguard increased the probability of trade deflection to third countries. Being landlocked and the proxy for macroeconomic conditions, *X*-

[21] The estimated Probit coefficients are difficult to interpret since they affect the probability of exporting to third countries through the cumulative distribution function (Angrist and Pischke, 2009)

$RATE_{SWEjt}$, seem to have no effect on the probability of exporting to third countries, as their coefficients are insignificant. Furthermore, it should be noted that the variable controlling for a shared border gets omitted for both specifications. The omission is due that a shared border perfectly predicts exports, and hence are 216 observations dropped.

TABLE 4
PROBABILITY ESTIMATIONS OF THE INDIRECT TRADE EFFECTS OF THE US SAFEGUARD

	January 1998 – December 2003		June 2002 – December 2008	
	(1)	(2)	(3)	(4)
VARIABLES	Logit export (0/1)	Probit export (0/1)	Logit export (0/1)	Probit export (0/1)
$\ln MASS_{SWEjt}$	4.835	1.998	1.068	0.832
	(0.120)	(0.048)	(0.036)	(0.000)
$\ln DIST_{SWEj}$	-3.704	-1.425	-2.201	-1.101
	(0.983)	(0.090)	(0.002)	(0.000)
$LANDLOCK_j$	-11.90	-4.934	-5.086	-3.554
	(0.991)	(0.109)	(0.006)	(0.000)
$BORDER_{SWEj}$	-	-	-	-
FTA_{SWEjt}	1.012	0.497	-0.267	-0.306
	(0.960)	(0.051)	(0.768)	(0.393)
$\ln X\text{-}RATE_{SWEjt}$		1.802		0.089
		(0.944)		(0.461)
$SAFEGUARD_t$	3.151	0.321		
	(0.104)	(0.056)		
NO $SAFEGUARD_t$			-0.221	-0.0358
			(0.098)	(0.093)
Constant	-88.05	-37.55	-240.2	-8.947
	(0.958)	(0.155)	(1.000)	(0.000)
Year by month FE	YES	NO	YES	NO
Observations	5,327	5,327	5,867	5,867
Number of bilat	74	74	74	74

P-values in parentheses

The second panel of Table 4 reports the probability estimates of the indirect trade effect of the termination of the safeguard. Column (3) reports the estimates of our baseline specification. The coefficient of economic mass is significant on a five per cent level and implies that a large economic mass of the trading countries increased the probability of export. The coefficients of $DIST_{SWEj}$ and $LANDLOCK_j$ are both significant on a one per cent level and show of negative signs, which implies that the probability of exporting to third countries decreased with bilateral distance and with the importing country being landlocked. An FTA partnership appears not to affect the probability as the coefficient is insignificant. $BORDER_{SWEj}$ gets omitted for the same reason as for specification (1) and (2) of Table 4. The coefficient of the variables of interest, $NO\ SAFEGUARD_t$, is significant

on a ten per cent level. The negative sign implies that the termination of the safeguard reduced the probability of exporting to third countries. To test the robustness, we once more use a Probit estimator. The Probit estimation yields the same significant variables as the baseline specification, although slightly smaller point estimates (compare column 3 and 4 of Table 4). $BORDER_{SWEj}$ is omitted once more, and the coefficient our proxy for macroeconomic conditions is insignificant. Having tested the robustness, we can conclude that the termination of the safeguard reduced the probability of exporting to third countries.

The probability analysis of the indirect trade effects shows evidence in favour of our hypothesis that the imposition of the safeguard increased the probability of trade deflection to third countries. Moreover, we expected that the termination of the safeguard would have a reducing or no effect on the probability of exports to third countries. The results show that the termination reduced the probability.

5.3 Estimation results of the indirect effects

Having found evidence in favour of the hypothesis that the imposition of the safeguard increased the probability of trade deflection, we proceed to report the gravity estimations of the indirect trade effects of the imposition of the safeguard. The results are seen in column (1) – (3) of Table 5. We begin with our baseline and preferred specification, which shows significant coefficients of expected sign for all variables (see column 1). Economic mass, a shared border and an FTA partnership are found to have had a positive effect on Swedish steel exports to third countries while bilateral distance and being landlocked as an importing country appear to have had a negative effect. Whereas the gravity and geographical variables are less interesting in the context of trade effects, we want to pay some extra attention to the FTA variable. Outlined in the theory section, a major determinant for trade deflection is the sunk entry costs. Our findings suggest that an FTA partnership – which likely lowers the entry cost – had a positive impact on the deflection to third countries. To be precise, our estimate shows that an FTA partnership with third countries increased the exports by approximately 66 percentage points. Thus, our analysis shows evidence in line with the sunk entry cost theory. The coefficient of $SAFEGUARD_t$ takes a positive sign and is significant on a one per cent level. The estimate implies that Swedish exports to third countries increased by approximately 42 percentage points in the wake of the safeguard. It is in line with our hypothesis as well as what the probability estimations predicted.

To test the robustness of the baseline estimates and to investigate whether out treatment of missing values matters, we estimate a specification where the missing values are not substituted with zeros. The results are seen in column (2). The number of observations decreases by 985, but it does not affect the results to any considerable extent. The coefficient of interest remains unchanged. While we do dismiss a log-linear form of the gravity equation as being appropriate, we do however estimate the baseline specification with OLS to see whether it changes the results. Since OLS cannot account for zero observations due to the log-linearity required, the number of observations decreases (see column 3 of Table 4). Comparing the OLS estimates with the baseline specification, it is noticeable OLS yields larger point estimates for all covariates. The OLS estimate of $SAFEGUARD_t$ yields an indirect trade effect of approximately 69 percentage points. As previously mentioned, we do not regard a log-linear form appropriate for the reasons discussed in section 4.2, but in this case, the OLS estimation contributes by confirming the evidence that the imposition of the safeguard had a profound indirect trade effect on Swedish steel exports.

TABLE 5
GRAVITY ESTIMATIONS OF THE INDIRECT TRADE EFFECTS OF THE US SAFEGUARD

	January 1998 – December 2003			June 2002 – December 2008		
	(1)	(2)	(3)	(4)	(5)	(6)
	Poisson	Poisson	OLS	Poisson	Poisson	OLS
VARIABLES	EXP_{SWEjt}	$EXP0_{SWEjt}$	$lnEXP_{SWEjt}$	EXP_{SWEjt}	$EXP0_{SWEjt}$	$lnEXP_{SWEjt}$
$lnMASS_{SWEjt}$	0.917	0.918	1.850	1.276	1.278	2.241
	(0.010)	(0.010)	(0.000)	(0.000)	(0.000)	(0.002)
$lnDIST_{SWEj}$	-0.804	-0.635	-0.780	-0.769	-0.727	-0.936
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$LANDLOCK_j$	-1.148	-0.324	-0.308	-0.855	-0.677	-1.286
	(0.041)	(0.484)	(0.683)	(0.097)	(0.122)	(0.45)
$BORDER_{SWEj}$	1.010	1.361	2.158	1.171	1.262	1.855
	(0.048)	(0.004)	(0.000)	(0.004)	(0.001)	(0.000)
FTA_{SWEjt}	0.507	0.507	0.536	0.197	0.197	0.261
	(0.001)	(0.001)	(0.123)	(0.214)	(0.213)	(0.131)
$SAFEGUARD_t$	0.351	0.351	0.526			
	(0.000)	(0.001)	(0.016)			
$NO\ SAFEGUARD_t$				-0.817	-0.830	-1.036
				(0.000)	(0.000)	(0.001)
Constant	-11.79	-13.21	-38.81	-21.51	-21.92	-47.19
	(0.248)	(0.192)	(0.000)	(0.003)	(0.003)	(0.000)
Observations	5,543	4,558	4,544	6,083	5,062	5,051
Year by month FE	YES	YES	YES	YES	YES	YES
Number of bilat	77	69	69	77	77	77

P-values in parentheses

The second panel of Table 5 reports the results of the gravity estimates of the indirect trade effects generated by the termination of the safeguard. Column (4) shows the estimation results of our baseline and preferred specification. The estimation yields the expected sign of all covariates, although with various significance. What should be highlighted is the insignificant coefficient of FTA_{SWEjt}. Intuitively, an FTA partnership is of less importance when the sunk cost of entering has already been paid and we, therefore, regard the insignificant coefficient of FTA_{SWEjt} as reasonable. The variable of interest is now $NO\ SAFEGUARD_t$. Its coefficient is significant on a one per cent level and shows a point estimate of -0.817. Translating the coefficient into percentage change yield that the termination of the safeguard led to a reduction in exports to third countries by approximately 126 percentage points. In a similar manner as earlier, we test the robustness of the estimates by studying whether our treatment of zero observations and choice of estimator affect the results. Column (5) reports the estimates when we do not substitute missing export values with zeros. The coefficient of $NO\ SAFEGUARD_t$ is slightly enlarged but shows the same sign as the preferred specification and is significant on a one per cent level. When the OLS estimator is used, the point estimate of $NO\ SAFEGUARD_t$ increases further and still shows of significance and a negative sign (see column 6). Hence, we conclude that the results of the preferred specification are rather robust and that our treatment of zero observation does not affect the result by much.

The analysis of the indirect effects demonstrates that the safeguard generated indirect trade effects. When the safeguard came into force, our findings show that Swedish steel export deflected to third markets. The increase in exports to third countries is estimated to be somewhat between 42 and 69 percentage points. The analysis cannot determine whether the increase was on the intensive or extensive margin, but it is possible that both existing trade flows increased and that new trade relations were created. The termination of the safeguard appears, on the other hand, to have had a negative impact on Swedish steel exports to third countries. The estimates show that Swedish steel exports to third countries declined by 126 percentage points when the safeguard was lifted. It thus appears as if the third markets were not perfect substitutes for the American steel market and that Swedish steel exporting firms did not honour the sunk entry cost by continuing to export to third markets at the same extent after the safeguard was lifted. Having summarised our findings, we want to emphasise that the analysis of the indirect trade effects is not without weaknesses. As mentioned in section 4.2, we have not been able to control for importer fixed effects as the models do not converge when we do. It is, therefore, possible that the estimates are inconsistent since unobserved heterogeneity may be present. However, by testing the robustness of the results, it appears as if the estimates are rather robust.

6. Conclusion

The aim of this paper was to investigate the direct and indirect trade effects of the US safeguard of 2002 on Swedish steel exports. The study does not only contribute to the literature by evaluating the trade effects of a rather unstudied measure but also by separating the trade effects of when the safeguard came into force and when it got terminated. Thus, our analysis intended to answer multiple questions where the first question to answer was whether the safeguard had any direct trade effects. We found that Swedish steel exports to the United States decreased when the safeguard came into force, but no evidence that the termination generated any trade effects. The second question to answer concerned whether the safeguard generated indirect trade effects on Swedish steel exports to third countries. Our analysis found that Swedish steel exports deflected to third countries when the safeguard was in force. The increase in exports to the third market is estimated to be somewhat between 42 – 69 percentage points. When the safeguard was lifted, our estimates show that Swedish steel exports decreased by approximately 126 percentage points. Linking back to the theory, sunk entry costs are often highlighted as a major determinant for export and thus deflection. Our analysis suggests that Swedish steel exporting firms found the sunk entry cost of the third markets acceptable when the safeguard came into force but did not stay and honour it when the safeguard was lifted. While there could be multiple explanations for this, we interpret it as the third markets were not perfect substitutes for the American market.

From a policy perspective, what do our findings imply? Our analysis demonstrates that import restrictive measures such as safeguards, do generate trade effects. While protection measures inherently generate direct trade effects, policymakers should be aware that the direct trade effects may, in turn, generate indirect trade effects. It should, therefore, be clear that a country's actions will not only affect its own trade. In the context of the ongoing trade conflict, what do our findings imply? The American steel and aluminium tariffs of today will presumably generate negative direct trade effects similar to those generated by the safeguard in 2002. It is therefore likely that it will also be indirect trade effects and it is possible that they will be more pronounced if firms anticipate the permanent nature of national security protection. While this paper has shown that both direct and indirect trade effects can be expected from both the imposition and the termination of safeguards, more research is needed to understand the consequences and trade effects of protection measures fully.

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Appendix

TABLE A1
HARMONIZED SYSTEM PRODUCT CODES

Product	*HS*	*Product*	*HS*	*Product*	*HS*
Coated Sheet	721020	Cold-rolled sheet	720915	Hot-rolled sheet	720810
	721030		720916		720825
	721041		710917		720826
	721049		720925		720827
	721061		720926		720836
	721069		720927		720837
	721220		720928		720838
	721230		720990		720839
	721250		721070		720840
	721260		721129		720853
	722591		721190		720854
	722592		722511		721114
	722599		722519		721119
	722693		722550		722530
	722694		722611		722540
	722699		722619		722691
Cold-finished bar	721350		722692	Tin mill products	720918
	721510	Hot-rolled bars	721491		721011
	721550		721499		721012
	721590	Stainless steel wire	722300		721050
	722820		731210		721070
	722850	Plate	730660		721090
	722860	W. tubular products	730511		721123
Stainless steel bar	722211		730512		721210
	722219		730519		721240
	722220		730520	Rebar	721310
	722230		730531		721420
	722240		730539	C. and A. fittings and flanges	730791
Stainless steel rod	722100		730590		730792
Slab	720712		730620		730793
	720720		730630		730799
	722490				

TABLE A2
SAMPLE OF THIRD COUNTRIES

the United Arab Emirates, Argentina, Armenia, Austria, Australia, Azerbaijan, Belgium, Bosnia and Herzegovina, Brazil, Bolivia, Bulgaria, Canada, Chile, China, Colombia, Costa Rica, Croatia, Cyprus, the Czech Republic, Denmark, Egypt, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, India, Indonesia, Iran, Ireland, Israel, Italy, Japan, Jordan, South Korea, Kuwait, Kyrgyzstan, Laos, Latvia, Lebanon, Lithuania, Madagascar, Malaysia, Mexico, Mongolia, Morocco, Myanmar, Netherlands, New Zealand, Niger, Norway, Pakistan, Peru, Philippines, Poland, Portugal, Romania, Russia, Saudi Arabia, Singapore, Slovakia, Slovenia, South Africa, Spain, Switzerland, Tajikistan, Thailand, Togo, Turkey, Uganda, Ukraine, the United Kingdom, Uzbekistan, Vietnam

TABLE A3
DATA SOURCES

Variable	*Description*	*Source*
$EXP_{SWE\text{-}US,t}$ and EXP_{SWEjt}	Swedish exports of 6-digit HS steel products (thousands of EUR, monthly)	Eurostat database
$MASS_{SWE,US,t}$	Economic mass: ($GDP_{SWE,t}$ + $GDP_{US,t}$) (current USD)	World Development Indicators
$MASS_{SWEjt}$	Economic mass: ($GDP_{SWE,t}$ + GDP_{jt}) (current USD)	World Development Indicators
$DIST_{SWEj}$	Distance between capitals (kilometres)	CEPII Geodist database
$LANDLOCK_{j}$	Country *j* being landlocked. 1=yes, 0=no	CEPII Geodist database
$BORDER_{SWEj}$	Shared border with country *j*. 1=yes, 0=no	CEPII Geodist database
FTA_{SWEjt}	Existence of FTA. 1=yes, 0=no	European Commission
$X\text{-}RATE_{SWE,US,t}$	Ration between SEK and USD at time *t*	Datastream
$X\text{-}RATE_{SWEjt}$	Ratio between SEK and country *j*'s currency at time *t*	Datastream
$SAFEGUARD_{t}$	Safeguard in force. 1=yes, 0=no	Govinfo.gov
NO $SAFEGUARD_{t}$	Safeguard lifted, 1=yes, 0=no	Govinfo.gov

TABLE A4
DESCRIPTIVE STATISTICS

Variable	Mean	Std. Dev	Min	Max	Obs.
Panel A: Direct effect sample[a]					
	January 1998 – December 2003				
$EXP_{US,t}$	9 266.218	2073.01	4986.85	14396.05	72
$lnMASS_{SWE,US,t}$	29.97	0.079	29.84	30.07	72
$lnX\text{-}RATE_{SWE,US,t}$	-2.18	0.1082575	-2.38	-1.99	72
$SAFEGUARD_t$	0.31	0.46	0	1	72
	June 2002 – December 2008				
$EXP_{US,t}$	13 432.78	6477.48	2137.91	33651.70	79
$lnMASS_{SWE,US,t}$	30.20	0.10	30.03	30.32	79
$lnX\text{-}RATE_{SWE,US,t}$	-2.00	0.12	-2.36	-1.78	79
$NO\ SAFEGUARD_t$	0.76	0.43	0	1	79
Panel B: Indirect effect sample[b]					
	January 1998 – December 2003				
EXP_{SWEjt}	1719.74	4054.11	0	61619.72	5543
$EXP0_{SWEjt}$	2091.39	4383.03	0	61618.72	4558
$lnEXP_{SWEjt}$	5.73	2.42	-6.91	11.03	4544
$lnMASS_{SWEjt}$	26.80	0.589	26.21	29.27	5544
$lnDIST_{SWEj}$	8.08	0.97	5.93	9.78	5544
$LANDLOCK_j$	0.19	0.40	0	1	5544
$BORDER_{SWEj}$	0.04	0.19	0	1	5544
FTA_{SWEjt}	0.26	0.44	0	1	5544
$lnX\text{-}RATE_{SWEjt}$	1.11	2.81	-3.56	8.41	5544
$SAFEGUARD_t$	0.31	0.46	0	1	5544
	June 2002 – December 2008				
EXP_{SWEjt}	2542.68	5391.05	0	45373.55	6083
$EXP0_{SWEjt}$	3055.24	5775.88	0	45373.55	5062
$lnEXP_{SWEjt}$	6.26	2.47	-6.91	10.72	5051
$lnMASS_{SWEjt}$	27.21	0.61	26.30	29.35	6083
$lnDIST_{SWEj}$	8.08	0.97	5.93	9.78	6083
$LANDLOCK_j$	0.19	0.40	0	1	6083
$BORDER_{SWEj}$	0.04	0.19	0	1	6083
FTA_{SWEjt}	0.39	0.49	0	1	6083
$lnX\text{-}RATE_{SWEjt}$	1.39	2.96	-3.55	8.42	6083
$NO\ SAFEGUARD_t$	0.76	0.43	0	1	6083

[a] the entire sample consists of neither zero observations nor missing observations

[b] the entire sample contains of 21 zero observations and 1 746 missing observations