Troop Contributions to CSDP Military Operations

How the ability to contribute impacts burden-sharing

Hauke Licht*

December 12, 2015

Abstract

This paper is prepared as a hand-in for the graduate course *Introduction to Empirical Approaches to Political Science* (POLSCI 630) taught by Kyle Beardsley, Ph.D., at Duke University in the autumn term 2015.

*Hauke Licht is student in the Master International Relations at the Humboldt-University Berlin, the Free University Berlin and the University of Potsdam, and participant of the Duke-Humboldt Graduate Exchange Program 2015/16 at Duke University in the autumn term 2015 and the spring term 2016. Contact: hauke.licht@duke.edu or hauke.licht.1@hu-berlin.de

Contents

1 Introduction

The Common Security and Defence Policy (CSDP) has recently become key to the European Union's (EU) external action (cf. Menon 2009). Particularly, it provides for the legal basis and institutional structure for military cooperation. Yet, the coordination of national foreign policies and military deployment in particular are also the source of tension between national governments. The political frictions, that characterize the process of European foreign policy coordination, have stipulated considerable scholarly attention; henceforth, the CSDP has been evaluated in terms of its efficiency to augment the EU's ability to influence the conduct and outcomes of international politics promote this goal.

Particularly its military dimension has been highlighted as being a constraining factor in this respect. A generally low level of national defense spending and capability shortfalls in operational deployment are argued to negatively affect the effectiveness of EU external action (Menon 2009). Terms like 'capability-expectations gap' (Hill 1993) and 'capability conundrum' (de France 2013) have been coined to describe this phenomenon.

This paper examines how EU member states' defense capabilities, specifically defense expenditure as share of GDP, affect their troop contributions to CSDP military operations. As an assessment of the link between members ability to contribute and their actual contributions to collective military defense, the analysis contributes to the burden-sharing literature, which will be briefly discussed in Section 2. After making the theoretical expectations explicit, Section 3 presents the data and the model that are used to assess how defense capability is related to troop contribution. Section 4 discusses the empirical results of the analysis, and Section 5 concludes.

2 Relevant literature and theoretical expectations

2.1 The public- and joint-good perspectives on burden-sharing

Stipulated by a lively debate on the inequities in NATO members burden-sharing during the 1960s, Olson & Zeckhauser (1966) have advanced an economic model of alliances. They conceptualize allies' contributions to a joint defense activity as the production of a purely non-rival and non-

excludable public good.[1] One key prediction of their model that economically more capable alliance members tend to bear a disproportionate share of the collective defense burden (Olson & Zeckhauser 1966, p. 268). This implication has come to be known as the *exploitation hypothesis*.

Other collective defense outputs, such as the multilateral deployment of military troops, however, are rather characterized by features of *joint goods* (Sandler & Hartley 2001, p. 876). Joint goods are characterized by a mixture a variety of outputs with different degrees of publicness (van Ypersele de Strihou 1967), and their provision has generally different implications with respect to both the proportionality in defense contributions and the efficiency of collective action among allies: To the extent some benefits are excludable (e.g., private gains in national security), cooperative gains are generally reduced; as the share of excludable benefits compared to non-excludable benefits increases, free-riding is curbed (Sandler & Hartley 2001, p. 878).

Recent contributors to the literature on the provision of multilateral peacekeeping operations (PKOs) have adopted the public-good approach (e.g. Schimizu & Sandler 2002). Some of these economic models have conceptualized PKOs as a joint good, allowing for donor-specific gains as well as pure public benefits (e.g. Gaibulloev et al. 2015).[2] Generally, donor-specific factors are thought of taste-shifters that impact countries' valuation of collective provision. If and how much national troops countries' contribute to PKOs is answered from an expected-utility perspective in this framework (e.g. Bove & Elia 2011), and the models highlight both, the determinative strength of private, donor-specific economic and strategic interests in the conflict region and specifically the target country of multilateral intervention, and the benefits derived from largely non-excludable benefits in regional and international security.

2.2 Theoretical expectations

Much of the qualitative literature on constraining factors of national troop deployment to CSDP military operations suggests that the nations, who poses relatively more military capabilities, are

[1] Benefits in defense are *non-rival* when consumption of one unit of the defense good by one ally does not in the least affect the amount of defense goods available to consumption for the other allies. Benefits are *non-excludable* if consumption by others cannot be prevented by others (Sandler & Hartley 2001, pp. 871f.).

[2] According to Gaibulloev et al. (2015, p. 2) "Donor-specific gains solely benefit the country providing the peacekeeping troops, police, and observers ..., while pure public benefits help all countries interested in reduced violence and enhanced stability.

those who lead in CSDP troop deployment (i.e., assume disproportionately larger burdens). Anand Menon (2009, p. 130), for instance, remarks that "Capability shortfalls have had a direct [negative] impact upon operational effectiveness" of the CSDP operations conducted until 2009, and Olivier de France (2013, p. 61) argues that such shortfalls cause member states' failure "to meet their national and collective security needs." These claims are theoretical in line with the exploitation hypothesis. They explicitly suggests that countries contributions to CSDP operations are dependent on their military capabilities, and hence it is expected that:

> *Hypothesis* 1*:* Member states' ability to contribute is positively related to their actual contributions to CSDP military operations.

On the other hand, and from a yet another theoretical perspective, countries with lower defense capabilities might face incentives to contribute to security cooperation. This expectation is reasoned by the *alliance-dependency rationale*, which rests on the notion of the alliance security dilemma (Snyder 1984). Alliance members face a trade-off between abandonment and entrapment when they determine the level of commitment to, and compliance with, an alliance's cause. In the long-run, a low level of compliance may result in being abandoned by the allies; strong compliance to the alliance's cause, on the contrary, often results in disproportionately high private costs. If it holds true that member states with comparatively low levels of military capability depend stronger on the CSDP to conduct multilateral operations than their peers, then the dependency logic incentives them to over-subscribe contributions to the common cause. The dependency rationale thus leads to expect:

> *Hypothesis* 2*:* Member states' ability to contribute is inversely related to their actual contributions to CSDP military operations.

Menon's (2013, p. 53) underscores this expectation, observing that the convergence of member states threat perceptions and the simultaneous downsizing of their national defense capabilities—in terms of both defense spending and military hardware—create strong incentives for military cooperation in European security and defense.

It is, however, reasonable to question, if the relationship between the ability to contribute and

actual contributions is simply linear. On the one hand, the incentive to over-subscribe contributions might be only significant in the lower (upper) quantiles of the 'ability' distribution. Different levels of defense capability likely correspond to different levels in other indicators of economic welfare that might outweigh the effect of capability on contribution. On the other hand, the seemingly contradictory exploitation and the dependency rationales may factor simultaneously, constituting a complex mixture of motives. This would result differential effects depending on the actual level of defense capability.

Hypothesis 3*:* The relationship between member states' ability to contribute to CSDP military operations and their actual contributions is non-linear.

3 Empirical strategy

3.1 Data and measurement

The dependent variable Member states actual contributions to the EU's CSDP are measured as the average annual amount of national troops deployed to CSDP military operations. Member state's troop deployments are considered to be a valid indicator of states' contributions to their collective security objectives (Bove & Elia 2011). The focus on military operations is justified by the observation that the three types of personnel that are contributed to PKOs—military troops, police, and observers—are associated to different levels of risk, specifically with regard to civilian and battlefield deaths (Gaibulloev et al. 2015, p. 5). Excluding the EU's policy and observer missions ('civilian missions' in the terminology of the European External Action Service) thus allows to hold constant a set of operation specific factors that likely impact national deployments.

The natural logarithm of national troop contributions is applied, because they are strongly right skewed. This transformation not only appears to be a technical necessity—the OLS estimator is biased if the dependent variable is not normally distributed—, but the effective exclusion of non-contributing member states from the analysis is also imperative from a conceptual perspective: There occurs a selection into contribution that is qualitatively different from a quantitative

increase in the dependent variable by one unit.[3] Note further that troop contribution is a count variable, which technically poses the problem of censoredness of the dependent variable. There exists, however, no latent distribution for non-participants, neither can the assumption of latent negative values be supported. Following Bove & Elia (2011, p. 707), fitting a censored regression model is thus not feasible.

Figures on troop contributions are obtained from the Multilateral Peace Operations Database (2014*b*) of the Stockholm International Peace Research Institute (SIPRI). Variation in troop contributions is analyzed across six CSDP military operations over a time period from 2003 to 2010, and the sample includes all EU member states, except from Denmark.[4] Table 1 lists participation in, and contributions to the 13 operation-year configurations.[5]

The key explanatory variable Countries' ability to contribute is measured as defense spending relative to to gross domestic product (GDP). Analysts and observers of the CSDP argue that member states' defense expenditure is an important determinant of their ability to contribute effectively to the CSDP (Giegerich & Wallace 2004, Grevi & Keohane 2009, de France 2013). Annual figures on defense expenditure as share of GDP are obtained from Eurostat (2015).[6]

There exist three main reasons to focus on the effect of the level of defense spending on CSDP troop contributions. First, the strong emphasis observers and theorists put on differences in defense expenditure with regard to its aggregate impact on the effectiveness of the EU's Common Foreign and Security Policy makes an investigation relevant from a policy perspective. Second, even though the compatibility of defense and military budgets across countries (and maybe across time) is

[3]The increase in contribution from zero to one troop is essentially not comparable to the effect that results in an increase from ten to eleven troops. This is also the reason why I have decided against adding one or any finitesimal number to all figures (including the zero-contributions) and taking the natural logarithm of the sum in order to analysis the whole sample.

[4]Denmark opted out of the Common European Foreign and Defense Policy, following the Danish electorates yes vote in the on May 18, 1993; see http://www.fmn.dk/eng/allabout/Pages/TheDanishDefenceOpt-Out.aspx

[5]Since some current EU members did just access in 2004 and 2007, respectively, there are 14 observations for each operation in 2003, 24 for each operation-year configuration between 2004 and 2006, and 26 for each operation-year from 2007 on, resulting in total 306 observations.

[6]Eurostat is the statistical office of the EU, which collects data directly from member states, and thus arguably the most reliable source and is expected to produce comparatively less attenuation bias. Missing observations figures for Greece before 2006 are imputed from SIPRI's Military Expenditure data (2014*a*). SIPRI is a reasonable source for imputation, as from 2006 to 2010 Greek country-year figures are highly correlated with Eurostat data ($\rho = 0.9509$).

TABLE 1
EU Member States' national troop contributions to CSDP military operations, 2003–2010.

	Artemis	Concordia	EUFOR Althea							DRC	Tchad/RCA		Somalia
	2003	2003	2004	2005	2006	2007	2008	2009	2010	2006	2008	2009	2010
Total Troops[a]	150	1968	6270	6270	5964	2261	1963	2024	1950	2275	3404	1009	141
$\sum^{EU}$ Troops	130	1903	5502	5502	5107	1766	1673	1482	1587	2259	3274	1009	141
Austria	5	3	221	221	[f]285	3	100	142	[f]297	3	169	33	0
Belgium	6	66	52	52	47	117	0	0	0	59	64	26	6
Bulgaria						0	117	120	117		2	0	0
Cyprus			0	0	0	0	0	0	0	1	2	2	1
Czech Republic			90	90	65	4	0	0	2	0	2	1	0
Estonia			3	3	33	3	2	2	2	0	0	0	0
Finland	4	0	[f]184	[f]184	177	50	43	3	5	11	62	3	4
France	[f]82	[f]1639	[f]463	[f]463	[f]477	109	89	4	4	[f]975	1770	633	25
Germany	4	7	1014	1014	861	120	110	119	118	[f]745	4	3	13
Greece	5	2	88	88	89	45	45	43	49	1	4	3	2
Hungary			142	142	139	156	[f]156	[f]160	[f]170	0	3	2	4
Ireland	0	5	51	51	62	38	43	62	43	2	447	26	5
Italy	5	1	955	955	888	305	266	277	189	56	104	109	18
Latvia			3	3	2	2	2	0	0	0	0	0	0
Lithuania			1	1	1	1	1	1	1	0	2	2	0
Luxembourg	1	0	1	1	1	1	1	1	1	1	2	0	1
Malta			0	0	0	0	0	0	0	0	0	0	3
Netherlands	2	1	384	384	301	77	74	72	75	44	71	6	0
Poland			244	244	195	195	[f]198	48	186	125	421	62	0
Portugal	2	0	237	237	193	14	54	0	51	53	2	1	15
Romania						55	51	53	64		2	1	0
Slovakia			4	4	45	39	39	39	40	0	1	1	0
Slovenia			90	90	94	36	31	28	29	1	14	1	0
Spain	4	1	492	492	512	362	[f]242	[f]303	139	132	112	85	38
Sweden	7	81	77	77	67	23	0	0	1	50	10	5	4
United Kingdom	3	97	[f]706	[f]706	[f]573	11	9	5	4	0	4	4	2

[a] In some operations also non-EU-members contributed; hence the difference between total and the sum of EU-member troops.
[f] flags contributions to operation-years in which the respective country was framework-nation.
Cells left empty for years in which country was no member of the EU.
Source: SIPRI Multilateral Peace Operations Database (2014*b*)

limited,[7] defense expenditure is still considered to be a valid indicators of countries' ability to shoulder collective defense burdens (Hartley & Sandler 1999). Also, military expenditure is most likely only directly affecting contributions to military operations, as police and civilian observers are often at least partially financed from different budgets. The latter reason making an investigation of the relationship between troop deployments and military expenditure conceptually coherent; the former making it relevant to the broader burden-sharing literature. Thirdly, the fact that the vast majority of operational costs is financed by member states themselves (the so-called 'costs-lie-where-they-fall principle') reasons to expect strong effects of donor-specific determinants of troop contribution, such as national defense spending. In fact, the lack of a marginal cost sharing scheme, which would implement a compensation for personnel or equipment contributed by participating states, is argued to augment the incentives to free-ride on other members' contributions (Olson & Zeckhauser 1966).[8]

Control variables Countries' trade openness serves as proxy variable to account for member states' *private economic benefits* from the provision of CSDP military operations, and the likely differential incentives they face to contribute national troops. Gaibulloev et al. (2015) argue that the protection of trade interests in the region of multilateral intervention likely factors as positive taste-shifter of contribution. Though the estimates on the effect of trade openness on personnel deployment are rather inconsistent, increases in trade are found to be associated to cuts in military expenditure (Hewitt 1991, Seitz et al. 2015), and hence the variable is considered to be an important confounder. Note that Gaibulloev et al. (2015) maintain that the effect of trade interests on troop contribution is conditional on either geographic proximity, or specific dependencies on local resources from the intervention region. As bilateral trade data with the respective target countries is however coarse, trade/GDP is interacted with a binary variable that assumes a value of one if

[7] For one, definitions of defense budget composition vary across countries. Disaggregated expenditure figures reveal that there exist differences in charging different posts, such as equipment procurement, infrastructure/construction expenditure, research and development, or research and technology. There also exist systematic differences in the financing of professional versus conscription forces, and expenditure figures do not reflect efficiency of national contributions or contributions to the CSDP side-passing increases in defense spending (Foucault 2008, pp. 9-11).

[8] Even if renumeration occurs, the generally low share of pooled costs covered by operation-year specific ATHENA budget unlikely over-compensates the marginal costs of provision; particularly, as in EU states the marginal costs of expeditionary troops tends to be high compared to countries that are found to be net-gainers from contribution to PKOs (Gaibulloev et al. 2015, pp. 3f.).

the donor and target countries are located in the same region (according to World Bank region classifications), and is zero otherwise. Information on trade, measured as the sum of in- and exports as share of GDP, is obtained from the World Bank's (**?**) World Development Indicators (WDI) data.

To account for a *political source of taste shifting*, it is controlled for government parties' ideological position. Studies on foreign policy preferences of political parties stress that the proclivity to project military force in international crises varies systematically with political ideology (Blais et al. 1993, Klingelmann et al. 1994, Palmer et al. 2004). Similarly, the left-right policy dimension is expected to be associated with the level of defense expenditure. Hence, government parties' common position in the policy space is likely confounding the relationship between defense expenditure and CSDP troop contribution. Information on cabinet parties' positions on a left-right scale is obtained from the Parliament and Government Composition Database (Döring & Manow 2012). The mean position of a cabinet's (coalition) parties are summed by cabinet, and devided by the number of cabinet parties; resulting in a mean left-right cabinet position.[9] The cabinet that was in office at the date of proclamation of a CSDP military operatin is defined as the government then currently responsible for deciding on national contributions.[10]

Further, *differences in wealth* are found to affect countries' troop contributions to multilateral peacekeeping operations. Gaibulloev et al. (2015, p. 4) argue that countries' valuation of stability and peace is positively associated to their willingness to contribute national troops to peacekeeping operations, and increases with their levels of wealth. Collier & Hoeffler (2002, p. 7) second this with respect to military expenditure in general, finding that "The share of GDP devoted to military spending is strongly increasing in the level of per capita income." (cf. Hewitt 1991) GDP per capita is considered to proxy for countries wealth. Annual GDP per capita figures are obtained from WDI data (**?**).

[9] Obviously, government's mean position is identical with cabinet party position in case of single-party governments.

[10] Specifically, the indicator of government postion is matched by cabinets' start dates and the dates on which the respective CSDP operations were officially proclaimed (either by an EU Council Joint Action or an EU Council Decision). No threshold is imposed on the number of days a government need to be in office before being able to decide on troop deplyoments. This is an abitrary operationalization and certainly worth questioning: If proclamation is preceded by deliberation, governments might decide on deployment even before the official proclamation date. Also, cabinets that are in office only since, say, about a month might just adopt the position, particularly if key positions in defense ministries and the higher ranks of the military are characterized by a strong cross-cabinet continuity.

The average of the total number of troops deployed to other peacekeeping missions in the previous three years is included to account for the *troop constraint* to which donor-countries are principally subjected regarding the deployment of their military capabilities (Bove & Elia 2011, Gaibulloev et al. 2015). All other equal defense expenditure is expected to be positively associated with the total number of deployed national peacekeepers, assuming that the costs are not immediately sunken in GDP growth. Figures on national deployments to peacekeeping missions are obtained from the replication data of Gaibulloev et al. (2015), and is aggregated across all UN and non-UN missions by country-years.[11]

To account for the spillover effect that is expected to occur in national personnel contributions to mulitlateral peacekeeping operations (Gaibulloev et al. 2015), it is controlled for the average amount of troop contribution by all other CSDP members' in a given operation-year.[12] Note that the troop spillover is considered to be endogenous in the deployment decision, and omission would result in biased estimates.

Further, an indicator is included that measures the size of the corresponding ATHENA budget (if it applies), devided by the total amount of troops provided by EU members in a given operation-year. This indicator is meant to account for the marginal renumeration resulting from costs covered by the ATHENA mechanism. The effective renumeration from the pooling of operational costs or other marginal cost sharing schemes is generally expected to facilitate troop deployments (Olson & Zeckhauser 1966, Bove & Elia 2011, Gaibulloev et al. 2015). Figures on the amount of costs covered by the ATHENA mechanism in a given operation-year were provided on individual request by the European Concilium Public Service on June 8, 2015.

[11]The country-year dataset was kindly provided on individual request by Khusrav Gaibulloev and Todd Sandler on October 23, 2015.

[12]This is equivalent to capture the spatial lag anticipated in troop contributions by including the product of others' contributions and the row-normalized sum of the elements of a spatial weight matrix with connectivity being defined as EU *co*membership (Beck et al. 2006). It is indeed theoretically reasonable to expect that national troop contributions in a given operation-year are not independent from one another: Generally, the magnitude of a countries' response (i.e., troop contribution) may depend on how other members respond and, conversely, its own response may affect the contributions that other countries' governement's decide on. This represents an interdependence in the deployment of national troops. "[Interdependence] refers to processes by which outcomes in some units, y_j, affect outcomes in others, y_i." (Franzese & Hays 2007, p. 142). Technically, Franzese & Hays (2007) show that if interdependence is relevant, estimates of coefficients for unit-level and contextual variables in non-spatial regression models are inefficient, and often biased and inconsistent. What is more, Gaibulloev et al. (2015) find evidence for complementarity in national contributions to non-UN PKOs.

In addition, a binary indicator flags countries' that served as framework nation in a given operation-year, as defined in SIPRI (2014*b*).[13] Operational leadership is considered to be a major driver of operational deployment (e.g. Menon 2009), and financing the logistic and personnel costs arising from operational leadership likely increase military expenditure (assuming that these costs are not immediately sunk by a resulting increase in GDP).

3.2 The model

The effect of increases and decreases in member states' relative defense expenditure on their troop contributions to CSDP military operations is assessed employing the spatial auto-regressive ordinary least square (S-OLS) estimator.

Troop contributions to CSDP military operations are thus modeled as a linear combination of countries' relative defense expenditure, RDS, including a first-order polynomial to account for the nonlinearity of the marginal effect anticipated in Hypothesis 3, RDS^2; the product of the outcome variable in other members, $j \neq i$, and the row-normalized spatial connectivity matrix defined by EU membership, $\mathbf{W}$; the set of control variables discussed above, $\mathbf{C}$; country fixed effects, fe; and an error term, u, specific to country-operation-year configurations:

$$\log(\text{Troops})_{i,m,t} = \beta_0 + \beta_1 \text{RDS}_{i,t-1} + \beta_2 \text{RDS}^2_{i,t-1} + \beta_3 \mathbf{W}\text{Troops}_{j,m,t} + \mathbf{C}\boldsymbol{\beta} + \text{fe}_i + u_{i,m,t}, \qquad (1)$$

where m denotes CSDP military operations, t years, and i EU member states participating in m at t. Pooling all observations, and decomposing the error into a country-specific (time-invariant) effect and a random error term appears feasible, as only operations EUFOR Althea and EUFOR Tchad/RCA constitute time-series, where the latter was conducted only in 2008 and 2009.

Trade/GDP, GDP per capita, and the sum of peacekeepers deployed to other PKOs vary across country-years;[14] government's left-right position, operational leadership, and the spatial lag of other member contributions vary with country-operation-year configurations;[15] the marginal renumera-

[13] Namely 'designated lead states', http://www.sipri.org/databases/pko/methods

[14] Figures on trade/GDP and per capita GDP are missing for Lithuania before 2003. The values on the three year moving averages and the first-order lags are imputed from most recent available data.

[15] The Czech Fischer cabinet, responsible for deployment decisions to EUFOR ALthea in 2009 and EUTM Somalia, was caretaker of governmental business. No left-right position indicator data available for this cabinet. Values have

tion per troop by ATHENA budget varies with operation-years; and the indicator that flags whether the donor and target countries were located in the same region varies with country-operation configurations.

The set of country-specific control variables includes temporal lags: the three-year moving averages ($t-3$ to $t-1$) of trade/GDP, per capita GDP, and the total amount of contributions to UN and non-UN PKOs.[16] The moving average of per capita GDP and PKO deployments are log-transformed, due to their strong right-skewness.

Lagging RDS, in turn, prevents from observing an association with troop contributions that is causally reverse to the relationship implied by Hypotheses 1, 2 and 3, and formalized in model (1). As the anticipated positive associations between operational leadership and defense expenditure on the one hand, and troop contribution on the other hand, operate at $t-1$ and t, respectively, both the actual indicator and its first-oder lag are included.

Generally, the set of control variables is thought to account for confounding effects of the relationship between countries' relative defense expenditure and CSDP troop contributions, as the unbiasedness of the OLS estimator, is critically dependent on the selection-on-observables, or conditional independence assumption. In particular, the fixed-effects are included to account for country-specific unobserved characteristics that impact both troop deployment and RDS.

Recalling the theoretical expectations, we expect to find the coefficient on RDS positively signed in order to confirm Hypothesis 1, negatively signed in order to confirm Hypothesis 2 instead, and a non-linear relationship (Hypothesis 3) would be indicated by finding the marginal effect of RDS on contribution to vary as a function of RDS.

---

been imputed from previous government.

[16] The lag-structure implies a specific temporarily in the decision-making process of national troop contributions: The current responsible government i, m, t is assumed to base its deployment decision on information from the previous years. This is reasonable, because troop deployments are essentially politically decided and current year information is generally contingent.

4 Empirical results

Table 2 reports the coefficient estimates from fitting S-OLS regression models on the log of troop contributions to CSDP military operations between 2003 and 2010.[17] Robust standard errors are reported, as the variance of the residuals is found to be non-constant.[18]

Model 1 tests Hypothesis 1 against Hypothesis 2, including the set of potential confounders and country fixed-effects. The effect of RDS on troop contribution is positive, but not statistically significant ($p > 0.1$). This gives reason to reject Hypothesis 2, but prevents from drawing inference in favor of Hypothesis 1.

Including the first-order polynomial of RDS too, and thus testing for non-linearity of the effect of RDS on national troop contribution (Model 2), however, allows to confirm both Hypotheses 1 and 3: National troop contributions to CSDP military operations are positively associated with RDS; yet, the relationship is found to be curve-linear.

The marginal effects plot displayed in Figure 1 illustrates this relationship. In the range between 0.2 and 2.2 percent of GDP spend on defense, troop contributions increase with RDS, but the strength of this positive effect is attenuated the more RDS approximates a threshold of 2.2% RDS. Around 2.2 percent RDS the marginal effect of increases in RDS on troop contribution is found to be weakest, while the predicted level of troop contribution is highest. Further increases in RDS, in fact, decrease the expected level of national troop contribution (all other equal), that is, the marginal effect of increases in RDS is negatively signed above the 2.2%-threshold.

Note that between 2003 and 2010 only Greece and Great Britain spent more than 2.2 percent of their GDP on defense; and Estonia only in 2009. In fact, 90 percent of all observations in the sample have a RDS ($t-1$) of 2.3 or below (see upper horizontal axis of Figure 1). The reversal in sign of the marginal effect of RDS on the log of troop contribution is thus strongly driven by the few observations above the 90%-percentile.

Interestingly, though the 95% confidence-bounds become larger at higher RDS due to the lower

[17] The *R*-code to replicate the results presented her can be find in the supplementary materials.

[18] Figure 2 in the Appendix illustrates this. Also, both Breusch-Pagan and White tests of heteroskedasticity evaluated for each of the models reported in Table 2 strongly support this conclusion. Specifically the interaction between the same-region indicator and the moving average of trade/GDP, and the average amount of total PKO deployments in the previous three years are found to be important sources of heteroskedasticity.

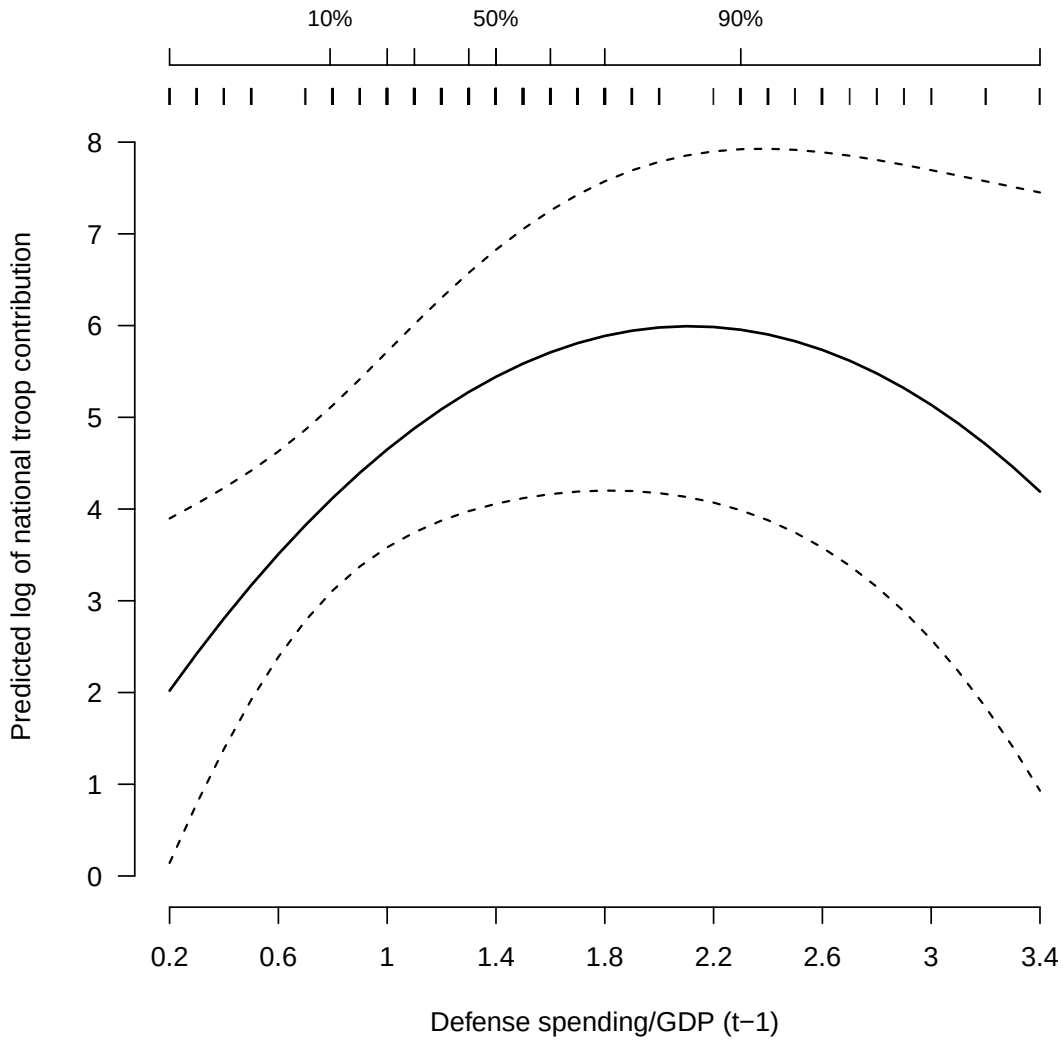
TABLE 2
Predictors of national troop contributions to CSDP military operations, 2003–2010.

	Log of troop contribution in operation-year		
	(1)	(2)	(3)
Defense spending/GDP ($t-1$)	0.735	4.533***	4.379***
	(0.509)	(1.376)	(1.358)
Defense spending/GDP squared ($t-1$)		−1.055***	−1.030***
		(0.342)	(0.342)
Average trade/GDP ($t-3$ to $t-1$)	−0.007	−0.008	−0.010
	(0.010)	(0.009)	(0.010)
Same region	1.589***	1.556***	0.056
	(0.430)	(0.422)	(0.700)
Mean government left-right position	−0.224***	−0.254***	−0.243***
	(0.068)	(0.072)	(0.073)
Avg. per capita GDP ($t-3$ to $t-1$) (log)	1.683***	1.773***	0.443
	(0.521)	(0.522)	(0.677)
Avg. PKO deployment ($t-3$ to $t-1$) (log)	0.079	−0.046	0.036
	(0.201)	(0.207)	(0.212)
Avg. troop contribution of other members	0.010***	0.009***	0.005***
	(0.001)	(0.001)	(0.002)
ATHENA budget/CSDP-member troops	0.013	0.012	0.013
	(0.014)	(0.014)	(0.013)
Framework nation	1.991***	2.043***	2.041***
	(0.421)	(0.422)	(0.414)
Framework nation ($t-1$)	−0.689*	−0.622	−0.601
	(0.398)	(0.397)	(0.411)
EUFOR Althea			1.758***
			(0.549)
Trade/GDP X same region	−0.002	−0.002	−0.003
	(0.003)	(0.003)	(0.003)
Country fixed effects	Yes	Yes	Yes
Observations	250	250	250
Adjusted R^2	0.882	0.884	0.887
F-statistic	51.292***	50.975***	51.542***
Robust standard errors in parentheses	*p<0.1; **p<0.05; ***p<0.01		

number of observations, the marginal effect of RDS on national troop contribution is distinguishable from zero with a (Type I) error probability of less then five percent over the entire empirical range.

Considering the regularly only very small changes in RDS over time within countries between 2003 and 2010, and the fact that only 10 percent of all observations lie above the 2.2%-threshold,

FIGURE 1
Effect of defense spending on nationl troop contributions.



Note: The solid line depicts the predicted level of the log of national troop contribution to CSDP miltiary operation 2003–2010 as the share of defense expenditure on GDP $(t-1)$ increases over the empirical range. The predictions are based on Model 3 (Table 2), holding all other covariates at their median values, and defining the intercept of Austria as baseline. Ticked lines flanking the solid line indicate 95% confidence-bounds. The distribution of observations is plotted at the upper horizontal axis, where single observations jitter minimally to illustrate density, and axis ticks demarcate percentiles.

allows for a substantial interpretation of the non-linear relationship. Troop contributions of member states in the 30–90% quantile-range are strongly driven by RDS, while marginal changes in RDS do effect their relative over-subscription comparatively less. (The lower 95% confidence-bound indicates only very small changes in the difference that marginal increases in RDS make.) Contributions

of states with low RDS (in the lower 30%-percentile of the distribution) are found to contribute less troops. Yet, marginal increases in RDS have a comparatively stronger positive impact on their troop contribution.

Lastly, increases in RDS in states who spend more than 2.2% of their GDP on defense are predicted to reduce the amount of troop contributions. Note that only Great Britian's and Greece's defense expenditure are located in the 90%-percentile of RDS. This gives reason to argue that the predicted reversal in sign of the marginal effect is strongly contingent on the relative reluctance of these both member states to deploy national troops to CSDP military operations, given their high levels of RDS. In sum, in the vast majority of cases (countries) higher RDS is associated to higher troop contributions. This leads to conclude that the countries, which are relatively more capable to contribute in terms of defense expenditure, actually contribute more to CSDP military operations.

With regard to the control variables, the level of trade on GDP is not systematically related to troop contribution in Models 1 through 3, disregarding whether or not the operation was conducted in the region as the donor country is located. One might conclude that private economic interests in the target region of multilateral deployment are negligible in explaining troop contributions to CSDP operations. A different proxy variable, however, might lead to another conclusion, and a better indicator of targeted economic interest is thus warranted. Also, Model 1 and 2 suggests that countries deploy on average more troops to operations that were located in the same region, while Model 3 reveals that the observed pattern in troop contribution is rather explained by characteristics specific to operation EUFOR Althea.

The effect of differences in economic wealth is the other finding that is contingent on the inclusion of the dummy that flags the 151 observations for contributions to EUFOR Althea between 2004 and 2010. While Models 1 and 2 suggest that member states deploy the more troops the higher their per capita GDP (averaged over the previous three years) is, Model 3 reveals that this positive association is confounded with contributions to EUFOR Althea.

The following results are consistent across all models reported in Table 2. Governments' mean left-right positions are negatively associated to the amount of troop deployments. The more leftist a government is, the more national troops it is found to deploy to CSDP military operations. The

coefficient on the the average deployment of all other CSDP members in a given operation-year, that is, the spatial troop spillover term, is positively signed and highly statistically significant.[19]

Countries serving as framework nation in a given operation-year are found to contribute on average more national troops to CSDP operations. Countries' that assumed operational leadership in the previous operation-year, however, are found to contribute less troops to an operation's current year. This negative association might be due to the fact that if countries' serve as framework nation in one year, they rarely do so in the subsequent year (cf. Table 1). Yet, the effect is only statistically significant in Model 1.

Lastly, the ATHENA-budget-to-CSDP-troops ratio, and the average amount of contributions to (UN and non-UN) PKOs in the previous three years exert no statistically significant effects on troop contribution. Hence, neither does the marginal renumeration for troops positively affect troop contribution, nor do deployments to other PKOs substantially constraint CSDP contributions.

4.1 Robustness

Including both the constituent and first-order polynomial of RDS at t through $t-3$ does confirm that only RDS in the previous year (and the corresponding polynomial) significantly affect troop contribution. Using SIPRI (2014*a*) figures on relative defense spending instead of Eurostat data does reduce the level of certainty in the effect of RDS on CSDP troop contribution, though the signs of the effects are consistent.[20]

Further, the results of Model 2 and 3 that lend support to Hypothesis 1 and 3, are robust to (a) including a simple one-year lag structure instead of three-year moving averages on the controls that are included as temporal lags, (b) interacting trade openness with geographical distance (measured in kilometer) instead of the same-region dummy,[21] (c) using the three-year moving average of FDI outflows as an alternative indicator of economic interest,[22] (d) including the strength of national

[19]Though the estimate is smaller then one, it is significantly larger than zero, indicating some extent of complementarity in CSDP troop contributions.

[20]The coefficient on RDS is found to be insignificant with $p > 0.10$, and the squared term is only significant at the 10% level. This is possibly due to the lower variance of SIPRI figures and the resulting efficiency loss.

[21]Distance was computed using the SSC `geodist` Stata-package, respectively using the longitude and latitude of donor and target countries capitals according to World Bank (**?**) data.

[22]Figures on annual outflowing foreign direct investment (FDI) are obtained from the UN Conference on Trade and Development (**?**).

military personnel as a potential additional source of troop constraint,[23] or (e) using different definitions of government position (median or a seat-share weighted mean).[24]

4.2 Diagnostics

Though there exist some observations with high discrepancy (e.g. French contributions to EUFOR DR Congo, which deviate positively from the predicted levels), only Bulgaria's contribution of two troops to EUFOR Tchad/RCA in 2008 (negative discrepancy) exerts a high leverage on the linear fit. The observations exclusion from the sample, however, does not substantially affect the results with regard to the non-linear effect of RDS on troop contribution. Testing for serial autocorrelation gives negative results, suggesting no statistically significant dependence of residuals in subsequent years. Further, the variance inflation induced by the set of independent and control variables is generally high. There is, however, no easy fix to this problem. As it has been thoroughly argued above, the controls are likely confounders of the relationship between troop contribution and relative defense spending, and excluding single controls would thus incur omitted variable bias. That is, multicollinearity and the resulting efficiency is accepted in order to reduce omitted variable bias.

4.3 Remarks on sample selection and simultaneity biases

It is imperative to stress that it is likely that different selection processes underly member states' decision to participate in a CSDP military operation (a binary, all-or-nothing choice), and how many troops to deploy, if it participates (an matter of degree). Table 1 clearly reveals that the number of non-participations is in fact not negligible. Generally, modeling troop *contribution* faces a sample selection problem, as the latter choice is precede by the former. Put differently, to the extent that the selection into participation is at least partially determined by unobserved factors, it is likely that the random-sampling assumption of the OLS estimator is violated and the errors of the selection and the outcome model are correlated—resulting in biased estimates.

Fitting a sample selection model to account for the selection into participation might provide

[23] Figures on the strength of national military personnel comes from Correlates of War (2014) for years 2003 and 2004, and the European Defence Agency (2014) for all other years.

[24] The results of the robustness checks (a) through (e) are reported in the supplementary *R*-code.

some leverage to account for this source of bias (Heckman 1979). However, the sample-selection model proposed by James J. Heckman (1979) relies on an exclusion restriction. At least one of the factors that determine the participation decision must not affect the subsequent contribution choice, given participation. Unfortunately, such factors are generally hard to identify, maybe particularly so in the context of peacekeeping contributions (Bove & Elia 2011). It is thus no wonder that no exclusion restriction could be identified in the sample of EU member states' contributions to CSDP military operations between 2003 and 2010.

With regard to the spatial dependence of troop contributions, employing the OLS estimator to fit a spatial correlation model (S-OLS) incurs *simultaneity bias* (Beck et al. 2006). Correcting for this source of bias would require to employ maximum-likelihood methods, which lies not within the scope of this paper. Franzese & Hays (2007) conclude from Monte Carlo simulations that "the simultaneity biases of S-OLS are typically smaller [compared to simple OLS estimates], especially as the strength of interdependence, ρ, remains modest in truth and domestic and exogenous-external factors are well-specified and powerful explanators." (p. 145) Generally however, not knowing the 'true' strength of spatial interdependence gives reason to question the unbiasdness of the coefficients on the presumably exogenous factors. Concluding that the model is well-specified is hampered by these doubts, and we consequently do not know whether the bias of the S-OLS estimator resulting from simultaneity bias is sufficiently low.

5 Conclusion

The reader is left with the conclusion that the results presented here need to be considered with caution, as different sources of bias limit the degree to which the estimates on RDS and its first-order polynomial can be interpreted causally. A maximum-likelihood estimator might allow to circumvent the problem of simultaneity bias. Accounting for selection on the dependent variable and the resulting sample selection bias, however, appears to be more demanding. A separated analysis of the factors that determine the participation in CSDP military operations might elevate some intuition with regard to a potential exclusion restriction in the selection process.

Nevertheless, the empirical results of quantitative analysis conducted here allow to draw a dif-

ferentiated picture of burden-sharing in the EU's CSDP. On the one hand, all other equal, more capable states (in terms of defense spending) are found to contribute on average more national troops to CSDP military operations. Yet, the positive effect is attenuated in the subsample of countries that spend around 2.2% percent of their GDP on defense, and members with comparatively high RDS (specifically, Greece and Great Britain) are found to deploy less troops than a linear prediction based on RDS would make us expect.

It is important to stress that the cross-sectional perspective assumed in the analysis has little to say to the debate whether increases of national defense budgets would facilitate CSDP military cooperation. It might indeed be the case that there occurs some equilibrium tendency in troop contributions, such that a general increase in RDS across all countries would not affect the total level of troop deployment. Yet, there exists some evidence that national troop deployments are complementary. This, in fact, suggests some 'unity of purpose' in member states' collective endeavor (Gaibulloev et al. 2015). It also confirms that it is important to account for spatial interdependence when modeling peacekeeping deployments.

6 References

Beck, N., Gleditsch, K. S. & Beardsley, K. (2006), 'Space is more than geography: Using spatial econometrics in the study of political economy', *International Studies Quarterly* **50**, 27–44.

Blais, A., Blake, D. & Dion, S. (1993), 'Do parties make a difference? parties and the size of government in liberal democracies', *American Journal of Political Science* pp. 40–62.

Bove, V. & Elia, L. (2011), 'Supplying peace: Participation in and troop contribution to peacekeeping missions', *Journal of Peace Research* **48**(6), 699–714.

Collier, P. & Hoeffler, A. (2002), 'Military expenditure: Threats, aid and arms races', *World Bank Working Paper* **2927**.

Correlates of War Project (2014), 'National material capabilities (version 4.0)'.
URL: *http:// www.correlatesofwar.org/*

de France, O. (2013), Mapping the security and defence debate, *in* E. Gross & A. Menon, eds, 'CSDP between internal constraints and external challenges', number 17 *in* 'EUISS Report', EU Institute for Security Studies, pp. 58–68.

Döring, H. & Manow, P. (2012), 'Parliament and government composition database (ParlGov): An infrastructure for empirical information on parties, elections and governments in modern democracies. Version 12/10 15 october 2012'.
URL: *http://Parlgov.org/stable/data.html*

European Defense Agency (2014), 'Defense data portal'.
URL: *http://www.eda.europa.eu/info-hub/defence-data-portal*

Eurostat (2015), 'General government expenditure by function (cofog), defence (df02) [gov_10a_exp]'.
URL: *http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do*

Foucault, M. (2008), 'Does the european defence burden-sharing matter', *Conflict Management, Peace Economics and Development* **6**, 297–314.
URL: *http://martial-foucault.com/wp-content/uploads/2008/07/european-defense-burden-sharing-foucault-08.pdf*

Franzese, R. J. J. & Hays, J. C. (2007), 'Spatial econometric models of cross-sectional interdependence in political science panel and time-series-cross-section data', *Political Analysis* **15**, 140–164.

Gaibulloev, K., George, J., Sandler, T. & Shimizu, H. (2015), 'Personnel contributions to un and non-un peacekeeping missions: A public goods approach.', *Journal of Peace Research* **first view**, 1–16.

Giegerich, B. & Wallace, W. (2004), 'Not such a soft power: The external deployment of European forces', *Survival, the IISS Quarterly* (2), 163–182.

Grevi & Keohane, D. (2009), ESDP resources, *in* G. Grevi, D. Helly & D. Keohane, eds, 'European Security and Defence Policy: The First 10 Years (1999-2009)', European Union Institute for Security Studies, pp. 69–114.

Hartley, K. & Sandler, T. (1999), 'NATO burden-sharing: Past and future', *Journal of Peace Research* **36**(6), 665–680.
URL: *http://www.jstor.org/stable/424971*

Heckman, J. J. (1979), 'Sample selection bias as a specification error', *Econometrica* **47**(1), 153–161.

Hewitt, M. D. P. (1991), *Military expenditure: Econometric testing of economic and political influences*, International Monetary Fund.

Hill, C. (1993), 'The capabilityexpectations gap or conceptualising Europes international role', *Journal of Common Market Studies* **31**(3), 305328.

Klingelmann, H.-D., Hofferbert, R. I. & Budge, I. (1994), *Parties, Policies, and Democracy*, Westview, Boulder.

Menon, A. (2009), 'Empowering paradise? The ESDP at ten', *International Affairs* **85**(2), 227–246.

Menon, A. (2013), Political and strategic aspects: Pressures and constraints, *in* E. Gross & A. Menon, eds, 'CSDP between internal constraints and external challenges', number 17 *in* 'EUISS Report', EU Institute for Security Studies, pp. 51–57.

Olson, M. J. & Zeckhauser, R. (1966), 'An economic theory of alliances', *The Review of Economics and Statistics* **48**(5), 266–279.

Palmer, G., Regan, P. M. & London, T. R. (2004), 'Whats stopping you? The sources of political constraints on international conflict behavior in parliamentary democracies', *International Interactions* **30**(1), 1–24.

Sandler, T. & Hartley, K. (2001), 'Economics of alliances: The lessons for collective action', *Journal of Economic Literature* **39**(3), 869–896.

Schimizu, H. & Sandler, T. (2002), *Journal of Peace Research* **39**(6), 651–668.

Seitz, M., Tarasov, A. & Zakharenko, R. L. (2015), 'Trade costs, conflicts, and defense spending', *Journal of International Economics* **95**(2), 305–318.

Snyder, G. (1984), 'The security dilemma in alliance politics', *World Politics* **36**, 461–496.

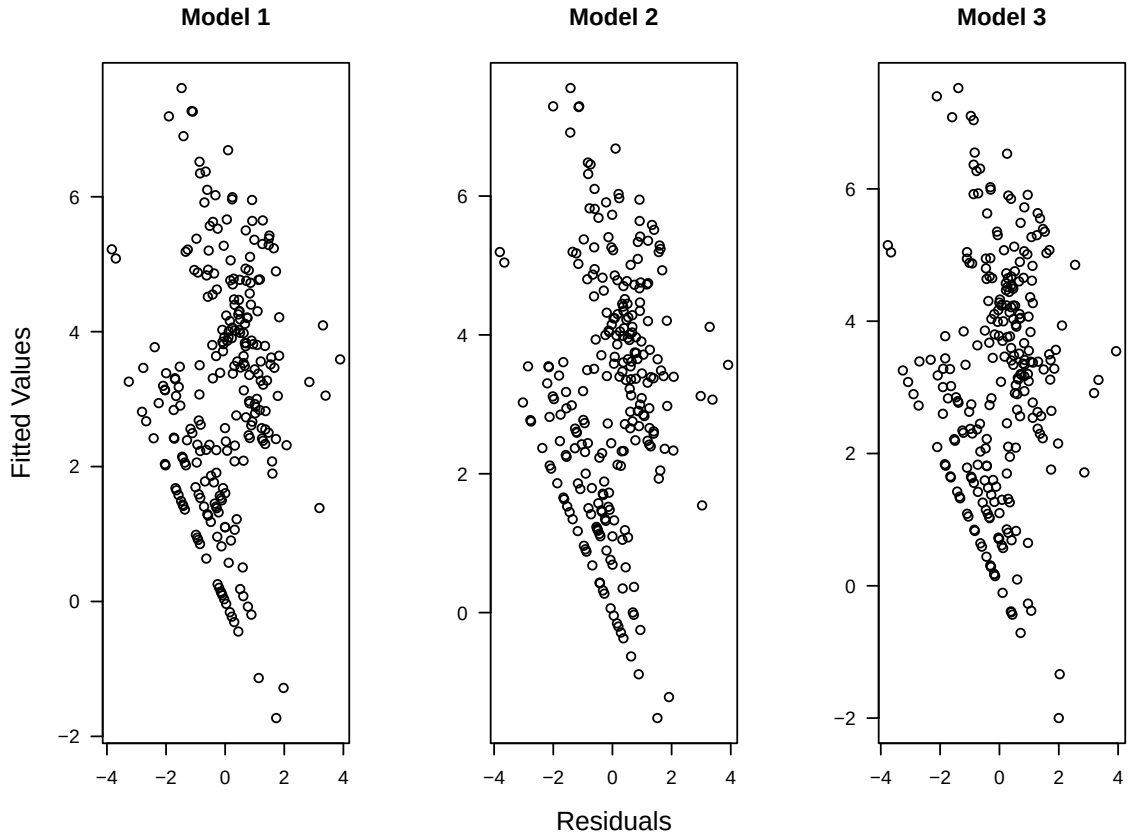
Stockholm International Peace Research Institute (2014*a*), 'Military Expenditure Database'.
URL: *http://www.sipri.org/research/armaments/milex/milex_database*

Stockholm International Peace Research Institute (2014*b*), 'Multilateral Peace Operations Database'.
URL: *http://www.sipri.org/databases/pko*

van Ypersele de Strihou, J. (1967), 'Sharing the defense burden among western allies', *Review of Economic Statistics* **49**(4), 527–536.

7 Appendix

FIGURE 2
Residuals-vs-Fitted values plot.



Note: Fitted-values plotted against residuals. Non-constant variance of residuals indicates heteroskedasticity. Predictions based on set of covariates included in Model 1, 2, or 3 reported in Table 2.