The Motivating and Mobilizing Effect of Inequality on Civil Conflict

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Abstract

This paper has two aims: 1) identify the causal effect of an individual's relative deprivation on civil conflict and 2) to find the mechanism by which deprived individuals can mobilize collective violence. Applying the Heckscher-Ohlin and Stopler-Samuelson theorems, which jointly explain trade's effect on the income distribution conditional on factor endowments, this paper exploits exogenous variation in tariff and relative land abundance to identify the causal effect of inequality on civil conflict. The findings indicate that a 5 percent increase in individual income inequality raises the probability of conflict by 3.9 percentage points, which amounts to 77 percent of the sample mean. Further, to identify the mechanism that explains how these deprived labourers can mobilize collective violence, this paper hypothesizes that increased unemployment within an ethnic group, while holding the group's total wealth constant, breeds more conflict initiated by the ethnic group. Based on this within-ethnic group inequality hypothesis, this paper examines 225 ethnic groups' demographic characteristics and finds that a 5 percent increase in unemployment within an ethnic group raises the probability of inciting an armed conflict by 0.1 percentage points, a 27.5 percent increase in the sample mean. These results pinpoint the criticality of inequality as a determinant of the motivation and mobilization of civil conflict.

1 Introduction

The question of whether economic inequality causes social unrest is one of the most enduring in social science. Since Marx (1848) claimed that widespread discontent over high inequality along the class cleavage is the fundamental source of internal conflict, many researchers have tried to find empirical evidence to prove the causal impact of uneven wealth distribution on political violence (Russett, 1964; Gurr, 1970; Fajnzylber, Lederman, & Loayza, 2002; Esteban & Ray, 2011). However, meta-analyses on this subject reveal that findings from macro quantitative studies are unclear and inconsistent (Midlarsky, 1988; Lichbach, 1989; Nygard et al., 2017; Bahgat et al., 2017). Lichbach (1989, p.464) states that "The statistical modelers have revealed that no clear answer about the economic inequality and political conflict nexus exists.... economic inequality is neither necessary, sufficient, nor clearly probabilistically related to [political] dissent." Fearon and Latin (2003, p.85) concur that "the Gini coefficient estimates of income inequality do not come close to either statistical or substantive significance [on civil war]."

Despite these alleged non-findings, contemporary studies argue that failures of the literature arise from inappropriate conceptualization and imperfect measurement, not from the absence of a causal relationship between income inequality and civil conflict (Stewart, 2008; Østby, 2008a; Cederman, Weidmann, & Gleditsch, 2011). These studies suggest that the explanatory focus needs to be shifted from vertical (between households or individuals) to horizontal (between groups) inequality (Stewart, 2005, 2008; Østby, Nordås, & Rød, 2009; Stewart, 2016; Cederman et al., 2011). Relying on relative deprivation theory, horizontal literature cites emotional frustrations resulting from inequality between ethnic groups as the cause of civil conflict (Gurr, 1970; Stewart, 2005). Further, as intergroup inequality strengthens emotional ties of grievance within a marginalized group, the group ideology and satisfaction in pursuing justice help to overcome the free-riding problem for collective violence (Blattman & Miguel, 2010; Cederman et al., 2011). Thus, non-material theories shed new light on the effect of horizontal inequality on both motivating and mobilizing civil conflict. However, on the empirical side, though the horizontal literature substantiates the association between intergroup inequality and civil conflict (Østby, 2008a; Østby et al., 2009; Cederman et al., 2011), it is a matter of debate whether the association represents a causal relationship. The OLS estimation that the horizonal literature relies on cannot address endogeneity issues including reverse causality or joint determination, which results in distorted estimates in both directions that are ambiguous ex ante.[1] Moreover, omitted variable bias stemming from insufficient controls in the identification model of horizonal inequality lit-

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[1]For instance, the OLS estimates can be biased upward if the presence of conflicts increases the inequality. At the same time, the estimates may be biased downward if the leaders reduce inequality when anticipating the internal strife.

erature undermines the accuracy of the estimates due to confounding factors that might create spurious relationship.[2]

While maintaining the prediction of the reduced-form that greater inequality motivates and mobilizes armed conflict, this paper suggests alternative frameworks based on the rationalist perspective and develops empirical strategies to compensate for the limitations of grievance theories. Though inequality has been conventionally acknowledged as the psychological foundation of violent behaviour (Fearon & Laitin, 2003; Collier & Hoeffler, 2004; Cederman et al., 2011), this paper introduces the economic interpretation of the conflictual role of inequality focusing on vertical inequality (i.e., inequality between individuals) within a country or ethnic group.[3] To construct conceptual frameworks, this study first integrates a general equilibrium model of social conflict (Dal Bó & Dal Bó, 2011) with economic theorems about the effect of trade on income distribution within a country (Spilimbergo, Londoño, & Székely, 1999). The combined model captures how inequality lowers the opportunity cost of fighting along the structure of factor ownership that varies with the country's factor endowments and the level of trade openness. In addition, this article applies the within-group inequality model to extend the unitary actor assumption that underpins the rationalist frameworks (Esteban & Ray, 2008, 2011). The model explains how economically deprived individuals who are motivated but separate can mobilize collective violence by exploiting financial resources from the rich and conflict labour from the poor within the same ethnic group.

These frameworks make a theoretical contribution to previous studies that have examined the economic cause of internal conflict. Beginning with the works of Collier and Hoeffler (2004) and Fearon and Laitin (2003), a burgeoning body of literature on the economics of conflict has found that low per capita income is a critical determinant of civil conflict in their cross-country models (Ray & Esteban, 2017). However, theoretically this absolute poverty has a contradictory effect on conflict because residents of poorer countries have a lower opportunity cost of rebellion, but pre-

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[2]The econometric models of grievance theories (Østby, 2008a; Østby et al., 2009; Cederman et al., 2011) include very limited set of controls. For example, the model of Cedeman et al (2011) does not include the level of democracy, mountainous terrain, natural resource and population density which are prominently cited in previous literature. Moreover, all of the grievance models do not include any fixed effects that effectively control for the unobservable factors of time-invariant or common time trend across entities. Since a large number of influential factors are time-invariant such as colonial legacy, religious fractionalization or geographical features, and are also related to common trend like the end of the Cold War or liberalization, excluding these fixed effect makes the OLS estimates easily biased by confounding factors.

[3]For instance, distributional asymmetries of wealth driven by higher unemployment decreases labour's payoff from working in productive sectors while increasing their benefits from looting capital or landowners who are little damaged by labour market conditions, consequently lowering labour's opportunity cost of fighting. Thus, allocating time to rebellion is the more rational choice for the worker when income inequality goes up. This implies that without innovative ways of modelling and measuring grievance, seemingly grievance-driven conflicts can be explained by cost-benefit analysis (Blattman & Miguel, 2010). This pattern also applies to mobilizing effect of intergroup inequality: the ethnic conflicts are prominent not because of emotional ties within the ethnic group but because of low costs for organizing a rebellion within ethnically homogeneous groups (Blattman & Miguel, 2010)

sumably, the returns from fighting are smaller too. This offsetting effect of absolute poverty on conflict implies that the opportunity cost of conflict initiation needs to be considered in relation to the benefits of looting (Esteban & Ray, 2008; Ray & Esteban, 2017). In this light, the income distribution that this paper focuses on offer a better basis for interpreting conflict from the economic perspective as higher inequality consistently increases the material incentive for fighting without offsetting effect by lowering the opportunity cost of fighting for the poorer and raising the benefit of looting the richer at the same time. In addition, rationalist theories of civil war based on methodological individualism view the groups as behaving like unitary actors (Cramer, 2002). This assumption prevents rationalist literature from explaining interim processes such as how motivated individuals gather, organize and engage in collective violence. By examining within-ethnic group characteristics, however, this paper reveals the causal mechanism that has received little attention from material theoretical accounts.

A more important contribution of this paper is that it develops a strategy for estimating the causal impact of income inequality on conflict. This study uses two sources of variation by applying the theorems of international trade. The Heckscher-Ohlin and Stopler-Samuelson theorems explain that if a country is land abundant, the relative factor price of land to labour is increased after trade because international trade equalizes factor prices across countries. In other words, international trade causes the rental price of land to rise in land-rich country while it increases income of labour for labour-rich country. As land ownership is prone to be more unequal than the ownership of labour that is endowed one unit to every person from birth to death, international trade makes a labour-rich country more egalitarian society while exacerbating inequality in a land-rich country. Using this logic, this paper first exploits exogenous cross-sectional variation in country's factor endowments that are measured by physical amount of land to labour. Then, it exploits time variation in trade openness from 1988 to 2015, which is captured by tariff changes. Using two sources of variation together, this paper constructs the interaction of factor endowments and an inverse form of a tariff rate of the country and uses it as an instrument for the country's income inequality in a given year. The instrument approach addresses the chronic endogeneity issues that have plagued previous efforts to examine the direction of causality. In addition, the instrument solves the problems of measurement error in inequality, where figures from developing countries are thought to be imprecise (Blattman & Miguel, 2010; Bahgat et al., 2017; Nygard et al., 2017; Ray & Esteban, 2017). Moreover, by constructing novel data that merge individual demographic information from the census with ethnic-level of conflict data, this study identifies the way in which an individual's deprivation generates collective violence. To the best of my knowledge, no previous studies have directly examined individuals' characteristics within

the ethnic group– the subject of conflict initiation. Most of these works offer circumstantial evidence that countries with greater vertical (between individuals) or horizontal (between groups) inequality experience more conflicts; there is no explicit evidence related to the actual subject who triggers conflict. By scrutinizing within-ethnic group features, this study substantiates which ethnic groups with which within-group individual characteristics are more likely to precipitate a war and how these characteristics facilitate the mobilization of collective violence.

The baseline estimates are consistent with the hypotheses of this paper. The instrument variable approach documents a causal relationship between individual inequality and civil conflict. The causal effect of inequality is not only statistically significant but also economically substantial: a 1 percentage point increase in inequality raises the probability that the country will experience civil conflict by 1.8 percentage points, which amounts to 40 percent of the sample mean. Furthermore, the analysis of within-ethnic group characteristics finds that the unemployed uses their ethnic group as a channel to mobilize collective violence. In addition, the mobilizing effect of ethnic group will be reinforced if the group's wealth is polarized because high inequality within the group enables the motivated individuals to easily recruit combatants from the poor members, and to receive financial resources from the rich. The mobilizing effect of within-ethnic group inequality is also significant and economically meaningful. A 1 percentage point increase in unemployment within the ethnic group, while holding the aggregate ethnic wealth constant, raises the probability of the conflict ignited by the ethnic group by 0.024 percentage points, which is 63 percent of the sample average.

The remainder of this paper proceeds as follows. Section 2 provides the conceptual frameworks for the motivating and mobilizing effects of inequality on civil conflict. Section 3 explains identification strategies for both effects of inequality on conflict. Section 4 presents data of this paper and descriptive statistics. Section 5 explains the results of the motivating and mobilizing estimations, and Section 6 offers concluding remarks.

2   Conceptual Frameworks

2.1   Motivating Effect of Inequality and the Opportunity Cost of Fighting

The Heckscher-Ohlin and Samuelson-Stopler theorems provide a theoretical foundation for how income distribution is systematically determined by factor endowments and trade. The most critical element of the theorems to predict inequality is the change of relative factor prices after international trade because it creates winners and losers along the factor ownership structure

within the country. If the country is land abundant, the country exports land-intensive commodities and consequently trade increases the relative rental price of land to that of labour. Similarly, if the country is labour-rich, the country exports labour-intensive commodities so the trade raises the wage of labour relatively to the rental price of land. Generally, the ownership of land tends to be easily concentrated to very few people because there is no upward limit to their accumulation per capita (Spilimbergo et al., 1999). In contrast, labour is endowed to one unit to every individual from birth to death and the level of skill that one individual can gain by education has natural upward limit (Spilimbergo et al., 1999; Ahlquist & Wibbels, 2012). Therefore, if the land-rich country specializes in exporting land-intensive commodities and subsequently the trade raises the relative price of land to that of labour, the wealth of this country will be concentrated in the hands of few land owners. But, if the country is labour-abundant and expands trade, the returns of trade are comprehensively distributed across almost all population, which lead to be more egalitarian society (Spilimbergo et al., 1999; Ahlquist & Wibbels, 2012). The following equations combine the structure of factor ownership with the Heckscher-Ohlin and Samuelson-Stopler theorems to present the relationship between inequality, relative factor prices after trade, and factor endowments and tariff.

$$\left(\frac{R}{L} \times \frac{1}{tariff} \right) \quad \propto \quad \Delta \frac{P_R^t}{P_L^t} \quad \propto \quad G \tag{1}$$

where 1/tariff captures the level of trade openness, and R and L denote the total physical amount of land and the total number of labours in a country, thus R/L indicates the ratio of factor endowments (or relative factor abundance of land to labour) of the country. P_R and P_L denote the factor price of land and that of labour respectively, and $\Delta(P_R^t/P_L^t)$ stands for the change of relative price of land to labour after international trade. Lastly, G denotes Gini coefficient, the measure of inequality, that approaches to one if inequality worsens. The left part of equation (1) represents the trade effect on relative factor prices conditional on the relative factor abundances. To be specific, the increase in relative factor abundance of land to labour (R/L) together with the level of trade openness (1/tariff) proportionately increases the relative price of land to labour after trade, $\Delta(P_R^t/P_L^t)$. Therefore, $\Delta(P_R^t/P_L^t)$ will be positive if it is land-rich country and negative if it is labour-rich country. The right part of equation (1) shows that inequality (G) exacerbates if the relative price of land to labour increases after trade because the trade returns are concentrated within few land owners, while inequality is reduced if the relative price of land to labour is negative after trade (i.e., increased wage of labour compared to the rental price of land). As all elements in the equation (1) are connected with proportionate relationship, it is also inferred that inequality is positively correlated with relative factor abundance of land to labour and trade

openness, which offers the exogenous source of variation in inequality.

Having identified the systematic effect of trade on the income distribution through the change in relative factor prices after trade, this paper incorporates this to the theory of the opportunity cost of insurrection. The general equilibrium model of social conflict (Dal Bó & Dal Bó, 2011) explains how price shocks to productive sectors generate civil conflict by lowering the opportunity cost of fighting. This paper substitutes the price shocks with the trade's effect on relative factor prices and explain how inequality driven by trade and factor endowments causes conflict in terms of opportunity cost.

The conflict model (Dal Bó & Dal Bó, 2011) considers an economy that has productive sectors and one appropriation sector (i.e., conflictual activity). It is assumed that productive sectors use labour and land as inputs and have technologies characterized by constant returns to scale. The firms are assumed to exhaust the value of production and clear factor market,[4] while appropriation sector uses only labour and redistributes outputs of the productive sectors. Given the technology, output prices (p_1 and p_2), and factor endowments (R and L), the equilibrium model determines the output production level (q_1 and q_2) and the rental prices of factors before specialization by trade (P_R and P_L). Under the conditions, the returns of appropriation sector (i.e., conflict) is written as follows.

$$A(L_A)[p_1q_1 + p_2q_2] = A(L_A)[P_RR + P_L(L - L_A)] \tag{2}$$

where the function of $A(L_A)$ specifies the fraction of the total value of production ($p_1q_1 + p_2q_2$). For convenience, the model (Dal Bó & Dal Bó, 2011) assumes the production function of appropriation ($A(L_A)$) is concave, which reflects diminishing returns to labour. As the expected total benefits are determined by the function of supplied labour $A(L_A)$, $A(L_A)$ can be regarded as the winning probability of civil conflict. Thus, $A(L_A)[p_1q_1 + p_2q_2]$ indicates the expected total looting benefit when L_A unit of labour are devoted in the conflict (i.e., appropriation sector). Under the assumptions that the factor market is clear and firms have zero profits, the expected benefits of civil conflict can be rewritten as the right side of equation (2).

To obtain the returns of an individual who engages in insurrection, equation (3) divides the total looting benefit with the units of labour participating in conflict (L_A). At equilibrium, this is equal to the returns when the individual is employed by the productive sectors – the wage (P_L) net of conflict losses, $[1 - A(L_A)]P_L$. In other words, the left-hand side of equation (3) indicates the individual's expected benefit from looting and the right hand side is the opportunity cost

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[4]To connect the theory of trade, this paper manipulates Dal Bó et al (2011) theory by replacing capital with land.

Figure 1: *Relative Factor Prices and Supply of Labour to Conflict*

Winning Probability

$$\frac{L_A}{\left(\frac{P^t_{R2}}{P^t_{L2}}\right)R_2 + L_2}$$

$$\frac{L_A}{\left(\frac{P_R}{P_L}\right)R + L}$$

$$\frac{L_A}{\left(\frac{P^t_{R1}}{P^t_{L1}}\right)R_1 + L_1}$$

$A(L_A)$

Conflictual Labours

L_{A2} L_{A0} L_{A1}

of engaging in insurrection. Equation (4) rearranges equation (3) in terms of the production function of the appropriation sector, $A(L_A)$. Given the concave function of $A(L_A)$ and fixed factor endowments, equation (4) indicates that the amount of labour devoted to the appropriation sector is determined by the relative price of land to labour.

$$\frac{A(L_A)}{L_A}[P_R R + P_L(L - L_A)] = [1 - A(L_A)]P_L \tag{3}$$

$$A(L_A) = \frac{L_A}{(\frac{P_R}{P_L})R + L} \tag{4}$$

As previously presented in equation (1), the relative factor price of land to labour is also the parameter of inequality since it affects the income distribution between land owners and labourers after trade. This implies that the amount of labour in appropriation sector (L_A) determined by the relative factor prices are also affected by the inequality. Figure 1 summarizes this relationship. The intersection of the concave function, $A(L_A)$, and the linear function of $L_A/((P_R/P_L)R + L)$ indicates the units of labours who choose to join in appropriation sector instead of working in the productive sectors. Since the initial relative factor prices reflect the price before specialization by trade, the relative price land to labour (P^t_{R1}/P^t_{L1}) is increased when a land-abundant country (Country 1) expands its trade due to the rise in the demand of land. The increase in the relative price of land to labour makes the slope of linear function less steep which leads to increase the

amount of labour engaging in internal strife ($L_{A1}^t > L_A$). But, if the labour-abundant country (Country 2) opens trade, the relative price of land to labour decreases. And this makes the slope steeper and lowers the amount of labour engaging in appropriation sector ($L_{A2}^t < L_A$).

$$\left(\frac{R}{L} \times \frac{1}{tariff} \right) \quad \propto \quad \Delta \frac{P_R^t}{P_L^t} \quad \propto \quad G \quad \propto \quad L_A \tag{5}$$

From the finding that the change of the relative price of land to labour after trade is proportionally related with the inequality, this paper can derive the first main hypothesis postulating that inequality raises the supply of labour to the appropriation sector as equation (5) presents. Moreover, since inequality exacerbates if a land-abundant country opens trade as shown in equation (1), we can predict that the supply of labour to the appropriation sector (i.e., conflictual labours) is increased if the land-abundant country expands trade, as indicated in equation (5). Thus, sub-hypotheses are also derived to validate the main hypothesis: the effect of factor endowments and tariff rate on inequality (H1.a) and the its reduced-form effect on civil conflict (H1.b).

H1 Income inequality among individuals should raise the risk of civil conflict onset.

> **H1.a** Economically liberalized countries more abundant in land relative to labour should be more prone to have high income inequality.
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> **H1.b** Economically liberalized countries more abundant in land relative to labour should be associated with a higher risk of civil conflict onset.

2.2 Mobilizing Effect of Inequality and Collective Violence

The opportunity cost approach assumes that deprived individuals act as unitary groups. Consequently, the process that forms organizational control over unconnected individuals was rarely discussed in the first conceptual framework. Since a rebellion is not impulsive and disorganized violence but an institutionalized collective action with clearly defined goals, the increase in motivated individuals should be regarded as a necessary but not sufficient condition.

To compensate for the motivation-oriented approach to social conflict, the second conceptual framework focuses on how the role of inequality can be formulated within the collective action context as a facilitator of mobilizing a rebellion. As opposed to the classic deprivation argument that equates individual motivation with collective dissent (Davies, 1962; Gurr, 1968, 1970), collective action theorists feature the process of mobilization as the public goods game that leads rational dissenters eventually choose to free ride (Lichbach, 1998; Olson, 1965). This is because

the benefit of conflict victory, such as changing policies or regimes, is a public good that can be enjoyed by anyone whether they participated in the rebellion or not; however, the costs of participation including labour, time and the risk of injury, jail and even death are incurred only by participants (Esteban & Ray, 2011; Kuhn & Weidmann, 2015; Lichbach, 1998; Olson, 1965).

Two solutions to the free rider problem – community and market– are suggested (Lichbach, 1998).[5] The community approach exploits the common belief system and solidarity of the community to promote cooperation among dissidents by breeding people's self-esteem derived from doing the right thing for their group. The market approach uses individual self-interests to lead members to the voluntary provision of their labour or resources by increasing the benefits, reducing the costs or increasing the probability of winning (Lichbach, 1998; Kuhn & Weidmann, 2015; Oliver, 1993). Therefore, to uncover the role of inequality in mobilizing the collective action, it is necessary to show how economic disparities among individuals are merged with the community and market strategies and exert the same or even greater effect on resolving the collective inaction problem.

On this matter, scholars of horizontal inequality have postulated the economic disparity that is relevant to conflict should be aligned with the cleavage among ethnic groups. As the intergroup asymmetries consolidate cognitive distinction between in group and out group categories through a process of group comparisons, theorists of horizontal inequality argue that intergroup inequality not only motivates violence by inciting anger and resentment within the disadvantaged group against the ruling elites or superior groups, but also facilitates the mobilization of collective violence through the solidarity of the ethnic community (Cederman, Wimmer, & Min, 2010; Cederman et al., 2011; Kuhn & Weidmann, 2015; Østby, 2008a, 2008b). In short, the theoretical framework of horizontal inequality elaborates the role of motivating and mobilizing effect of inequality by emphasizing the psychological factors embedded in an ethnic community: collective grievance as a motivation to fight and the solidarity of community as a way to overcome individual pecuniary self-interest to mobilize collective action.

In spite of its theoretical relevance to a community strategy for collective action, the discussion of horizontal inequality provides little market mechanism to explain the material conditions to sustain political insurgency. Though the mobilization is considered to be high cost (Muller, 1985; Jenkins & Perrow, 1977; Snyder & Tilly, 1972), the horizontal inequality argument tends to ignore its influence and even generate contradictory predictions. From the intergroup inequality perspective, the greater inequality between groups, the stronger the motivational and mobilizing

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[5]Lichbach (1998) suggests four solutions – market, community, contract and hierarchy. However, the last two solutions can only be applied to the government that has a legal authority to control the agents with formal institutions.

base for political violence it produces. In terms of resource mobilization, however, a larger economic disparity between group limits the amount of material resource available to the deprived group, and consequently diminishes its belief in the likelihood of success of collective violence (Muller, 1985; Jenkins & Perrow, 1977; Olzak & Shanahan, 1996; Snyder & Tilly, 1972). Thus, resource mobilization theorists argue that the solidarity and mobility of the powerless are encouraged under the conditions of declining (not growing) inequality and rising (not reducing) resources (Olzak & Shanahan, 1996). The results of empirical analysis of horizontal inequality studies are also inconclusive. Though greater intergroup inequality increases the risk of conflict (Cederman et al., 2011; Kuhn & Weidmann, 2015; Østby, 2008a, 2008b), it has not been proved that the deprived and motivated groups are significantly more likely to initiate internal conflicts than the wealthier counterparts.[6] Hence, the psychological factor-induced mobilization theory needs to be compensated to contain the logic in line with the market mechanism of collective action.

Taking the perspective of the resource mobilization and competition theory, this paper features inequality within the group not between groups as a facilitator of mobilizing a collective violence (Esteban & Ray, 2008, 2011; Gavrilets & Fortunato, 2014; Huber & Mayoral, 2012; Olzak & Shanahan, 1996; Ray & Esteban, 2017). Through the theories, this paper explains how within-group inequality ensures resource mobilization, particularly in the presence of intergroup competition (Olzak & Shanahan, 1996; Olzak & West, 1991). Partially, the theoretical frame takes the similar perspective of horizontal inequality theory in that it concedes ethnic group, not social class, as the unit of conflict initiation and acknowledges its role creating solidarity to overcome pecuniary self-interest.[7] However, the conceptual framework of within-group inequality focuses on the instrumental role of inequality to win the competition, not on its effect on causing grievance that emotionally drives ethnic conflict.

To explain the process of labour mobilization, the framework needs to explore how the within-group inequality that affects conflict is exogenously originated. As formulated in the first framework of motivation, the shrinking labour market due to liberalized economies raises the level of

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[6]The counter-evidence that has been adduced makes the findings less reliable. Olzak & Shanahan (1996) uncover the temporal processes of racial riots in American that were inconsistent with the prediction of horizontal inequality theory – the insurrections by the minority groups peaked during a period when their average incomes were approaching that of the wealthier group. Moreover, the study that used world-wide survey data covering 89 countries finds no statistical significant association between intergroup inequality and conflict (Huber & Mayoral, 2012). In-depth case study of Hindu-Muslim violence in India from 1950 to 2000 also provides contrasting results that economic similarity between groups breed tensions and leads more conflict (Mitra & Ray, 2014; Ray & Esteban, 2017).

[7]Horowitz (1985) argues that ethnic membership has more compelling effect than social classes since the effect of social class is mitigated by social mobility taking place in single lifetimes and across generation while ethnic membership given at birth is inescapable and inherited by generations and facilitates reaching pre-existing sentiment for community. Esteban & Ray (2008) also provide the theoretical framework to positively prove the salience of ethnic membership that is stronger than that of class.

intergroup competition among the less-skilled labourers in land-rich countries (Olzak & Shana-han, 1996). Given the heterogeneous constitution of factor ownership within the ethnic group of the countries, this trade-induced income distribution concentrates wealth in the hands of elites (i.e. the owner of capital and land) but reduces the job opportunities for the marginalized (Kuhn & Weidmann, 2015; Olzak & Shanahan, 1996). Consequently, the greater within-group inequal-ity is associated with the larger number of the unemployed while keeping the total wealth of the group mostly constant. This polarized wealth distribution is consistently merged with the market (i.e., pecuniary) mechanism of collective action. The central idea of the market approach is a selective incentive—offering material rewards exclusively to the participants in the collective action (Lichbach, 1998; Kuhn & Weidmann, 2015). In this selective incentive context, the choice to engage in rebellion is considered as another employment option particularly for those who become jobless or insecure in the contracting labour market (Dal Bó & Dal Bó, 2011; Esteban & Ray, 2011; Kuhn & Weidmann, 2015). Thus, the greater within-group inequality that accompanies the increase in number of unemployed, raises the supply of individuals with lower opportunity cost to fight and thus increases the supply of rebels (Esteban & Ray, 2011).

To complete the logics of market mechanism that coordinates the supply and demand of public goods by invisible hands, the within-group inequality should also induce people to volun-tarily pay the incentives for the participants (Oliver, 1993). During mobilization, the opportunity cost of the individual to fight is not based on the expected return of the winning, but on the immediate compensation given exclusively to the participants. Thus, to afford the total amount of compensation, financial resource should be supplied with the provision of labour from the marginalized group. In the presence of salient intergroup competition, the dominant individuals voluntarily contribute public goods because "if [their] group survives the between-group conflict, then there are other resources that dominant individuals can seize from their group-mates in within-group interactions" (Gavrilets & Fortunato, 2014). Particularly in ethnically fragmented countries, as the elites (i.e. dominant individuals) compete with political rivals from other eth-nic kin groups to maximize their access to executive power, the intergroup competition leads the ruling elites to bear the large costs for the mobilization (Cederman et al., 2010; Gavrilets & Fortunato, 2014). The fact that within-group inequality raises the public good contribution from the high-rank individuals has been theoretically proven (Bergstrom, Blume, & Varian, 1986; Esteban & Ray, 2011; Gavrilets & Fortunato, 2014). Gavrilet and Fortunato (2014) have found that the greater the within-group inequality, the more public goods the elites contribute to win intergroup competition. Theoretical works by Esteban and Ray (2011) elaborate that the concen-tration of wealth put the affluent people in a better position to contribute finance resources by

shifting the income from those who contribute fewer resources to conflict. The rich thus choose to contribute to make financial rather than physical contributions because their income is higher than the compensation for participating in rebellion. Similarly, the game-theoretic models for the provision of public goods substantiate that financial contributions are more likely to be made in hierarchical groups and thus likely to outcompete more egalitarian groups (Bergstrom et al., 1986; Esteban & Ray, 2011). In short, within group inequality specializes the provision of public good to mobilize ethnic violence – militants from the poor and funds from the rich – and thus creates synergy effect on the initiation of collective violence (Esteban & Ray, 2008, 2011).

Based on this conceptual framework, this paper sets a hypothesis that formulates the mobilization effect of within group inequality. Along with the main hypothesis, two sub-hypotheses are presented to verify the causal mechanism and its theoretical validity by comparison with the horizontal inequality effect. Using the fact that mobilization dynamics of within-group inequality embodies the mechanism of first framework of motivation, the first sub-hypothesis (H2.a) contains a new measure of within-group inequality. From the first framework, the motivated members are unemployed due to a shrinking labour market caused by open trade. At the same time, the ones who supply their labour to mobilize the rebellion are also unemployed since their opportunity cost is low. Thus, the sub-hypothesis (H2.a) postulates the within-group inequality as the proportion of unemployed in the group while holding total wealth constant. By doing this, this hypothesis can specify and test the causal mechanism that the two frameworks jointly explain. The second sub-hypothesis (H2.b) tests whether the total wealth of the ethnic group affects the likelihood of conflict initiation. Through the second sub-hypothesis, this paper can distinguish the effect of within-group inequality from those of low total income of the group, which seemingly overlapped in the sense of the high unemployment rate. Moreover, the hypothesis can provide counter-evidence of horizontal inequality argument that more deprived (and accordingly the more motivated) the group, the more likely it is to initiate the conflict, which will support the validity of the within-group inequality theory.

> **H2** The ethnic group with higher within-group income inequality should be more likely to initiate civil conflict.
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>> **H2.a** The increase in the number of unemployed within the ethnic group while holding aggregate wealth constant should be associated with a higher likelihood of conflict initiated by the ethnic group.
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>> **H2.b** The decrease in the aggregate wealth of the ethnic group should not be associated with the likelihood of the initiation of civil conflict.

3 Empirical Strategy

3.1 Causality Identification: the Motivating Effect of Inequality on Conflict

This section presents the empirical strategies to identify the causal (motivating) effect of inequality on civil conflict. As described in the conceptual framework of the motivating effect, this analysis exploits spatial variation in inequality due to a country's different factor endowments and time variation in inequality due to changes in tariff rates from 1988 to 2015. Using these two sources of exogenous variation together, this paper constructs an instrument (i.e., factor endowment multiplied by the inverse tariff rate) to examine the causal relationship between inequality and civil conflict. The equations (10) to (12) show each stage of Two-Stage Least Squares (2SLS) estimation of the instrument approach. In equation (11), the regression first extracts exogenous variation of income inequality driven by a country's trade policy and factor endowments. Then, by using the exogenous variation in inequality, equation (12) estimates the causal impact of inequality on civil conflict.

$$C_{ct} = \gamma \left(F_{ct} \times \frac{1}{T_{ct}} \right) + X_{ct}\Pi + \delta_c + \theta_t + \lambda_c Y_t + \varepsilon_{ct} \tag{6}$$

$$G_{ct} = \alpha \left(F_{ct} \times \frac{1}{T_{ct}} \right) + X_{ct}\Pi + \delta_c + \theta_t + \lambda_c Y_t + \varepsilon_{ct} \tag{7}$$

$$C_{ct} = \beta G_{ct} + X_{ct}\Pi + \delta_c + \theta_t + \lambda_c Y_t + \epsilon_{ct} \tag{8}$$

where the index c denotes countries and t denotes years. G_{ct} is the endogenous variable of interest, individual income inequality. C_{ct} is the primary outcome of interest, the onset of civil conflict. The interaction term of F_{ct} and T_{ct} constructs jointly the instrument, which denotes factor endowments (or relative abundance of land to labour) and a tariff rate of the country c in the year t. The tariff rate, T_{ct}, is change to an inverse fraction form, and multiplied with the factor endowments to linearly and positively predict the inequality. X_{ct} is a vector of country-year covariates that are importantly considered as possible determinants of conflict in the previous studies. γ_c and δ_t are country and year fixed effects which controls time-invariant characteristics of country and global time trend respectively. $\lambda_c Y_t$ denotes country-specific time trends that capture trend differences across countries.

To validate the three hypotheses in the conceptual framework of the motivating effect, all of γ, α and β should be positive and statistically significant. Though the instrument does not have a direct effect on the onset of civil conflict, it influences the outcome variable through inequality, which leads to the positive γ in equation (10). The first stage estimate, α in equation (11), should

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be greater than zero, indicating that land-rich countries with low tariffs are more likely to have a greater inequality. The coefficient of interest, β, means the magnitude of causal impact of inequality on the onset of civil conflict. Since both outcome and regressor are indicator variables that change from 0 to 1, a positive β implies that a 1 percentage point increase in inequality raises the probability of civil war outbreak by β percentage points on average. As β is the 2SLS estimate, it does not represent the average effect of whole observations, but the local average treatment effect of countries where the industrial structure optimally reflects the country's factor endowments.[8]

In addition to 2SLS estimation, this paper uses various fixed effects to make the instrument uncorrelated with confounding factors. The year-fixed effect, δ_t, and country-specific time trend, $\lambda_c Y_t$ helps to disentangle the variation of instrument from concurrent events: for example, the abrupt decrease in tariffs started from the early 1990s, particularly in the developing countries, and during the same period the countries began to politically liberalize. If the civil conflict is induced by political liberalization, rather than by inequality driven by low tariffs, the significant γ of the reduced-form estimate in equation (10) reflects a spurious time trend. Thus, this paper first controls all global time trends by the year-fixed effect to capture the influence of a wave of democracy across countries in late 1980s to early 1990s. Then, by adding the country-specific time trend ($\lambda_c Y_t$), the idiosyncratic trend is also controlled to address the differentials in country's capacity to react the global impact. In addition to time-fixed effects, this paper uses the country-fixed effect to reduce the omitted variable bias. Using only within-country variation, the time-variant instrument can generate the causal impact of inequality on civil conflict that is orthogonal to the country's structural features such as ethnic diversity or religious fractionalization.[9]

3.2   Mechanism Identification: the Mobilizing Effect of Inequality on Conflict

This section describes the strategies that identify the mechanism of mobilizing collective violence driven by unequal income distribution. The first strategy aims to find the subject and the channel of mobilization and the second strategy examines how the subject facilitates the collective action through exploiting what features of the channel.

To identify the subject and channel of mobilization, this study conducts a subgroup analysis.

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[8]Since this paper measures factor abundance (i.e., land-labour ratio) by comparing two factors of production out of three (i.e., land, labour and capital), the gross amount of the capital is always accompanied with instrument as a control variable to correctly capture the compliers whose structures are coherent with land-labour factor endowments.

[9]This is particularly important for civil conflict studies. Because, it is very hard to measure the grievance factors related with emotional frustration (Gurr, 1995; Collier & Hoeffler, 2004; Stewart, 2008; Collier, Hoeffler, & Rohner, 2009; Cederman et al., 2011; Mihalache-O'Keef, 2018). However, as the country-fixed effect controls the structural time-invariant characteristics, it is very effective to control the root cause of grievance is originated from country's time-invariant factors such as culture or identity.

Though the cross country - year model proves that unequal income distribution along the factor ownership structure (labours versus land-owners) raises the risk of civil conflict, the evidence does not specify the subject of conflict initiation and the channel of collective action. From the conceptual framework, the hypothesized subject is the individuals marginalized in the labour market – the unemployed; and the channel is ethnicity. To obtain empirical evidence that these hypothesized subject and channel are correct, the subgroup analysis checks whether the heterogeneous causal effect of inequality on internal conflict exists conditional on the different context of unemployment and that of ethnic diversity.

$$C_{ct} = \beta(G_{ct} \times D_{ct}) + X_{ct}\Gamma + \gamma_c + \delta_t + \lambda_c Y_t + \epsilon_{ct} \tag{9}$$

where D is a dummy variable of unemployment or ethnic diversity that is divided into two with the median value of each contextual variables; for instance, the dummy of unemployment is 1 if the country's unemployment rate is higher than the median level of world unemployment rate. Thus, if β is substantially large and statistically significant, the hypothesized subject and channel are proved right.

Having identified the subject and channel of mobilization, the ethnic-level analysis is conducted to examine how the unemployed individuals uses what features of their ethnic group to facilitate militant insurgency. As censuses are measured in different years with 10 year cycle for each country, the estimation takes the time average for all variables. Using the data with average of individual demographic values such as employment status, age and education within the ethnic group, this paper examines the determinants that lead the ethnic group to precipitate internal conflict against government.

$$C_{ec} = \beta U_{ec} + \gamma A_{ec} + X_{ec}\Theta + \eta_c + \psi_r + \varepsilon_{ec} \tag{10}$$

where e denotes ethnic group defined by EPR dataset (Vogt et al., 2015), c denotes country. U_{ec} is the mean of unemployment rate within the ethnic group from 1988 to 2015. The A_{ec} is the average of ethnic group's GDP. X_{ec} is a vector of mean value of individual's demographic characteristics including age, sex, education attainment, literacy, religion and residential area. The country fixed effect, η_c is added to control all time invariant unobservable factor at the country level.

The coefficient of interest, β, indicates the magnitude of the effect of unemployment on conflict initiation. However, at the same time, the β can stand for the effect of within-group inequality on conflict onset since the equation controls the total wealth of ethnic group; thus, the second hypothesis can be tested in equation (14). This ethnic-level estimation also tests which kinds of

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inequality between within-group inequality and intergroup inequality is associated with collective violence by comparing β and γ. If only β is statistically significant, the second hypothesis is proved right; and, if γ, the coefficient of the aggregate ethnic wealth, is statistically distinguishable from zero, the inequality between groups is better to explain the mechanism of conflict. To strengthen the validity of mechanism estimates, the country fixed effect is included to control all time-invariant confounding factors. Moreover, the analysis includes religion fixed effect and controls residential area to eliminate the possibility that the unemployed individuals might use other channels – religion or geographical proximity– across ethnic groups.

4 Descriptive statistics

4.1 Country-level Data and Measures

The main outcomes of interest, the onset of conflict, is constructed using the UCDP/PRIO Armed Conflict and the UCDP Battle-Related Deaths Datasets version 18-2018. The Uppsala Conflict Data Program (UCDP) defines an armed conflict as the use of armed force between the government and other opposition parties that results in at least 25 battle-related deaths in a year. The data divides conflicts into four types based on the territorial range of participating parties: extra systemic (i.e., between a state and a non-state outside its own territory), interstate, intrastate, and internationalized internal conflicts. The scope of this paper is limited to intrastate conflicts, between the government and one or more internal groups, without foreign intervention. The onset of civil conflict is coded 1 for country c in the year t when the government begins involvement in the conflict and 0 otherwise even if the war continues into the following years.

Inequality, the primary explanatory and endogenous variable of this paper, is measured by the Gini coefficient. If the Gini index is close to 1, the distribution of income among the whole population becomes more unequal within the country. This paper acquires the Gini coefficient index from the Standardized World Income Inequality Database (SWIID) version 7.1, which covers 192 countries from 1960 to 2017 and provides 5,226 country-years observations with estimates of gross income and net income Gini indices. The gross income Gini coefficient index is used as a main explanatory variable because the pre-tax income distribution is more directly linked to the instrument (i.e., tariff and factor endowments) than post-tax income distribution. This strong correlation between gross income inequality and instrument leads to a consistent and accurate 2SLS estimator and produces more valid statistical inference.

With respect to instrumental variables, this paper chooses the definitions and measures to

maximize their exogenous properties. First, this paper uses the ratio of physical units of two factors – total amount of land endowment divided by the working age population –to estimate factor abundance. As a measure of land endowment, the area of agricultural land (in 1000 hectare) is used; this figure is obtained from the Food and Agriculture Organization's (FAO) FAOSTAT database. The FAO defines agricultural land as the total area that can be used for cultivation of crops and animal husbandry. Unlike arable land that covers only the area under temporary cultivation, agricultural land encompasses the areas that are potentially cultivable but are not. The precise measure of factor is the exogenous endowed amount to each country, rather than factor's temporary supply that responds to market demand. Thus, this paper uses only the area of agriculture land as a measure of land endowment. In a similar vein, to measure labour endowment, the total working age population (ages 15-64) from the World Bank open database is used, instead of employed labour population that corresponds to market demand. The last component of instrument, the tariff rate, is estimated as a simple average tariff applied for all traded products, from the World Bank's open database. If the tariff is weighted by the import shares or by the portion of favoured trading partners, it might partially reflect the country's autonomous condition. Thus, this simple mean tariff for all trading products reflecting the general trend driven by the international systemic change in the early 1990s would minimize potential endogenous influence.

This study includes almost all of other country's characteristics that are prominently cited in the literature. These covariates can be classified into one of two conventional categories: grievance and greed. The primary characteristic of grievance is societal discrimination along the lines of cultural differences. As for the proxy of grievance, the ethnolinguistic fractionalization index based on the Atlas Narodov Mira database is used. Moreover, taking into account the political mechanisms that mitigate intergroup hatred, such as equal voting rights and freedom of speech and association, I use the level of democracy index from Polity IV project. To capture the greed conditions, this paper take into account material factors that favour insurgency in the cost benefit perspective. From the rebel's side, the most profitable geographical condition is rough terrain that provides shelters, hiding places and guerilla points from which to attack government forces, I adopt the portion of mountainous area coded by geographer A.J. Gerad from the World Bank as a proxy for this geographic condition related to greed (Fearon & Laitin, 2003). As the favourable demographic condition for rebel recruitment is a large number of people with limited education, the total population, population density and gross intake ratio of the first year of primary education (percentage of relevant age) are included. In terms of cost of rebel groups, if the government is badly financed and bureaucratically ineffective to reach into conflictual areas, the cost

Table 1: *Descriptive Statistics of Country-level Data*

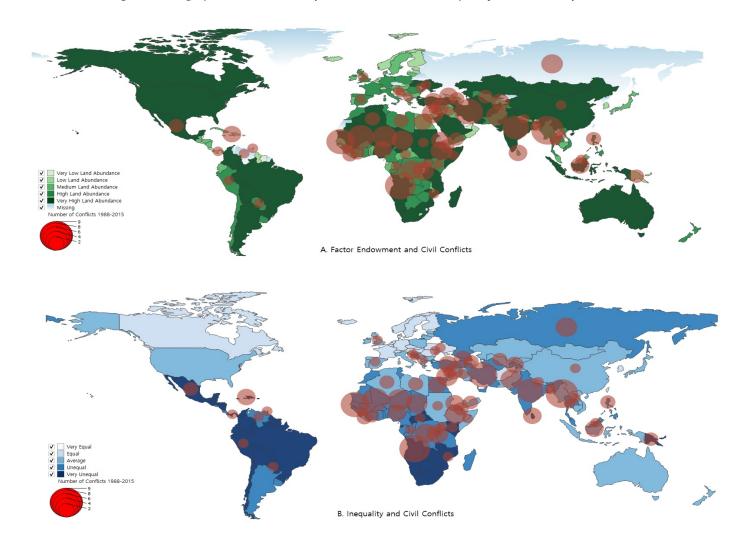| VARIABLES	(1) Mean	(2) Std. Dev	(3) Min	(4) Max
	A. Civil Conflict Measures (1988-2015)			
Onset of Civil Conflict	0.0448	0.207	0	1
ln (Death)/ ln (Population)	0.0585	0.132	0	0.663
	B. Inequality Measures			
Gross Gini Coefficient (SWIID)	0.384	0.0849	0.175	0.670
Net Gini Coefficient (SWIID)	0.384	0.0874	0.139	0.657
	C. Instrument Measures			
Tariff rate	9.036	7.447	0.0400	105.4
Agricultural Land (1000 ha)	25,851	67,743	0.300	528,635
Population 15-64	2.243e+07	8.750e+07	39,196	9.960e+08
Factor Endowments x (1/ tariff)	0.00106	0.0346	5.46e-07	1.811
	D. Covariates			
Gross capital formation (percent GDP)	23.26	8.362	-2.424	67.91
ln GDP per capita	7.998	1.634	4.546	11.69
GDP growth rate (annual percent)	2.148	6.544	-65.00	140.5
Fuel export (percent of merchandise exports)	15.29	26.04	0	99.97
Total natural resource rent (percent of GDP)	7.554	11.69	0	82.59
Net Foreign Direct Investment	-3.439e+08	1.763e+10	-2.320e+11	1.770e+11
Polity Score	2.860	6.754	-10	10
ln Population	15.40	2.193	9.077	21.04
Population Density	168.8	490.6	0.136	7,807
ln Mountaineous terrain	2.151	1.414	0	4.421
Ethnic Fractionalization	0.406	0.281	0.00100	0.925
Employment to Population ratio	57.55	11.41	29.18	89.24

of rebellion can be lower. Thus, the GDP per capita and regime durability are added to measure the financial and political capability of government respectively. To control the benefit of looting derived from natural resources including fuels, diamonds, coals that the return of agricultural commodity trade– a component of instrument –cannot capture, this paper adds total resource rent (percentage of GDP) and fuel export (percentage of merchandise export).

In addition to grievance and greed variables, this paper includes other external economic influences that relate to within-country income distribution and civil conflicts to reduce omitted variable bias. The foreign direct investment (FDI) are added to control the labor market effect of other international financial resource for industrial development, besides trade (Mihalache-O'Keef, 2018). The GDP growth rate is also included to distinguish the effect of economic shocks from that of income inequality on social unrest (Miguel, Satyanath, & Sergenti, 2004).

Table 1 reports the descriptive statistics for country-year level observations covering 147 countries from 1988 to 2015. As shown in Table 1, the onsets of intrastate conflicts are frequent events, which have been witnessed 182 times for 27 years. Figure 2 depicts the worldwide geographical dispersion of the onset of conflict, factor endowments and income inequality. If high income and

Western countries are excluded, factor endowments and inequality are notable indicators to the places prone to conflicts. The areas with numerous conflicts are concentrated to countries that are land abundant or have high income inequality. Existing studies have frequently discussed the reasons for temporal clustering of international liberalization and the salience of internal conflicts (Blattman & Miguel, 2010; Skrede Gleditsch & Ruggeri, 2010). However, their spatial clustering has not received enough attention. The obvious pattern of internal conflicts in time and spatial dimensions show that the onsets of conflict are not random but the outcome of social choices interacted with geographic conditions.

Figure 2: *Geographical Distribution of Factor Endowments, Inequality and Civil Conflicts 1988-2015*

A. Factor Endowment and Civil Conflicts

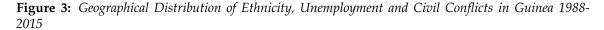B. Inequality and Civil Conflicts
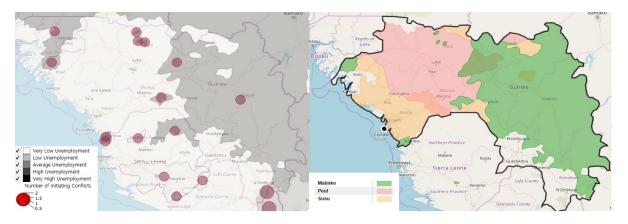
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4.2   Ethnic-level Data and Measures

In addition to the causality identified by the country-year level observations, I construct novel data that combine individual-level census with ethnic-level conflict records which link to the previous UCDP/PRIO intrastate conflict dataset to find the mechanism of collective violence. Merging three datasets enables examination of within-ethnic group characteristics measured by the average of demographic information of individual members and how these characteristics interact to affect the likelihood of initiating internal conflict.

In terms of constructing the data, the first step is to identify the ethnic groups that incite the conflicts, as listed in the UCDP/PRIO armed conflict data (ACD). The ACD data divide the participants into two sides: the government whose role is status-quo and internal rebel groups. ACD2EPR data version 2018.1, obtained from the International Conflict Research Center of ETH Zurich, specify ethnic groups that participate in the rebellion by linking ethnicities from the Ethnic Power Relations data (EPR) to the rebel groups listed in the UCDP/PRIO Armed Conflict data (ACD). Connecting the ethnic groups that join intrastate conflicts with ethnic-level information, such as population, GDP of the ethnic group, from the EPR, this paper identifies which ethnic group with what ethnic-level attributions incites collective violence.

The next step is to connect individual census information to an ethnic group. The IPUMS international provides 365 pieces of census data from 94 countries from the 1960s to 2010s. Most censuses are conducted every 10 years and include demographic information such as age, sex, marital status, race, ethnicity, employment status and residential area. To merge the census to the ACD2EPR, I use ethnic-related information to link individuals to their ethnic groups in the EPR dataset. If the census does not contain ethnicity information, other demographic characteristics such as mother tongue, religion, race and residential area are used to match each individual with an ethnic group. To enhance preciseness, the ethnic group's portion of population is checked to see whether each coded ethnic group comprises a similar portion of population from the record of the EPR. Due to data unavailability, censuses from 44 out of 95 countries are included, covering 225 ethnic groups and 110,000,000 individuals.

Based on this combined data, the outcome variable of interest, conflict onset, is constructed. The outcome variable is measured as the annual average numbers of intrastate conflicts that an ethnic group incites in the 27 years from 1988 to 2015. If the ethnic group initiated two conflicts in those years, the outcome variable is coded 0.074 ($\frac{2}{27}$). The primary independent variable is the individual level of deprivation within the ethnic group, measured by the average unemployment rate of each ethnic group. Though individual income more directly reflects economic status,

Figure 3: *Geographical Distribution of Ethnicity, Unemployment and Civil Conflicts in Guinea 1988-2015*

income data are unavailable in most censuses. Moreover, employment status links to the source of inequality – the factor endowments and tariff. The labourers in land-rich countries are more likely to lose their jobs as trade expands and consequently it increases income inequality. Thus, the unemployment rate represents the level individual deprivation within-group and links the findings of ethnic-level mechanism to the causality estimates of the country level.

The total wealth of an ethnic group, measured by average GDP from 1990 to 2005 or the brightness of night light of an ethnic group's residential area is used to examine the effect of within-group inequality on civil conflict. The independent variable, the unemployment rate within an ethnic group, has the meaning of inequality if the ethnic-level wealth is held constant. I use the average GDP of ethnic group that was measured in 1990, 1995, 2000 and 2005. Since the coverage of ethnic GDP was concentrated to the years before 2005, this paper uses the night light emissions of the ethnic residential polygon as an alternative proxy variable of the total wealth. Other demographic characteristics such as sex, age, literacy, education and marital status that are averaged at the ethnic-level are included as control variables. Residential information is also added, which closes to 1 if the ethnic group tends to live in rural area. As the co-membership of religion is a potential and important channel to mobilize the collective action besides ethnicities, the four religion dummies – Christian, Muslim, Hindu and Buddhist – that average the numbers of believers of each religion within the ethnic group is included to control religion channel of mobilizing collective violence. As depicted in Figure 2, the combined dataset enables to match ethnic-level characteristics, such as residential area or the number of conflict initiation, and within-ethnic group demographic information like the average rate of unemployment.

Table 2 reports descriptive statics for the ethnic-level observations during 1988 to 2015. As

Table 2: *Descriptive Statistics of Ethnic-level Data*

VARIABLES	(1) Mean	(2) Std.Dev	(3) Min	(4) Max
	A. Conflict Measures (1988-2015)			
Average of Civil Conflict Onset 1988-2015	0.00384	0.0147	0	0.107
Average of Conflict Incidence 1988-2015	0.0296	0.130	0	0.929
	B. Unemployment Measures			
Unemployment Rate	0.0890	0.112	0	0.544
Unemployment Rate in Rural area	0.0445	0.0636	0	0.372
Unemployment Rate in Urban area	0.0641	0.0715	0	0.383
Unemployment Rate in Agricultural sector	0.00323	0.0102	0	0.105
Unemployment Rate in Manufacture sector	0.00219	0.00503	0	0.0250
Aggregated Night Light	433,748	1.805e+06	5.000	1.959e+07
Average of Ethnic-level GDP 1990-2005	64.59	285.2	0.00618	3,149
	C. demographic Characteristics			
Rural Residence	0.602	0.269	0.0207	0.991
Martial Status	0.675	0.0886	0.380	0.915
Education Attainment	1.911	0.530	1.049	3.348
Literacy	2.109	3.552	1.100	34.33
Age	33.02	4.269	0.491	42.22
Sex	0.511	0.0831	0.169	1
Number of Child	1.335	0.388	0.0795	2.694
Ethnic Group's Population Portion	0.178	0.284	1.12e-05	0.981
Proportion of Christian	0.557	0.391	0	1
Proportion of Muslim	0.237	0.375	0	1
Proportion of Hindu	0.0140	0.0989	0	1
Proportion of Buddhist	0.0444	0.190	0	1
Proportion of Other religions	0.0575	0.160	0	1

indicated in Table 2, among 225 ethnic groups, 10 percent of the groups incited collective violence against their governments. While some ethnic groups in Mali, Philippines or Myanmar lived in conflicts for 25 years out of 27, the average period of exposing to conflicts is 10 months in those years. The average of unemployment rate per ethnic group is 9 percent. Though the urban unemployment rate is slightly higher than the rural unemployment rate, the unemployment rate in the agricultural sector is greater than that of the manufacturing sector. This reflects the trend of migration to urban area in developing countries, which has resulted in a labour shortage in the agricultural sector but a large unemployed population in the cities (Adesugba & Mavrotas, 2016). Another important variable is the proportion of the population that practices each religion, the other potential channel of collective violence. Most ethnic groups have a heterogeneous mixture of religions. The average ethnic group is 55.7 percent Christian and 23.7 percent Muslim. Other religions such Buddhism (4.4 percent) and Hinduism (1.4 percent) are also followed.

5 Results

5.1 Causality Estimates of the Motivating Effect

5.1.1 OLS Estimates

Panel A in Table 3 reports OLS regressions of civil conflict on gross individual income inequality. The equation of OLS estimation is the same as the second stage 2SLS equation (11) except the use of endogenous inequality variable without isolating its exogenous variation by instrument.

Each panel of Table 3 consists of two specifications: the estimation with and without fixed effects. In previous works that conduct cross-country (or cross-ethnic) and year analyses, the fixed effects have not been comprehensively used even though a few control variables definitely insufficient to address omitted variable bias. Thus, this paper documents the validity of estimates of the present models (with fixed effects) by comparing the estimates without fixed effects.

The specification without fixed effect in columns (1) to (3) show no correlations between income inequality and the onset of internal conflict. As well as the statistical insignificant OLS estimates, the magnitudes of OLS coefficients are not economically meaningful. The R^2 of the regression in columns (1) to (3) presents that only 0.1 to 3.6 percent of the variation in internal conflict is associated with variations of inequality and other controls. In contrast, the estimated magnitude of the specifications with fixed effects in columns (4) to (6) are 0.19 to 0.458, raised by 0.3 on average from the estimates without fixed effects. This implies that the omitted variables in columns (1) to (3) negatively bias the OLS estimates, leading to the motivating effect of inequality on conflict being understated. In addition, the regression in column (6) explains 25 percent variation of civil conflict ($R^2 = 0.249$). Comparing to column (3), it indicates that the fixed effects can explain 21 percent of the differences of civil conflicts, which improves the explanatory power by approximately 6-fold. In spite of the betterment, the statistical significance of the relationship between inequality and conflict still remains unchanged from zero, which is consistent with the results of the previous literature.

Overall, the results of OLS estimates in the panel A in Table 3 show a statistically insignificant correlation between gross income inequality and internal conflict. Nevertheless, it requires serious caution to conclude that the causal effect of income inequality on conflict does not exist because the OLS estimation, even with various fixed effects, cannot address the endogeneity issues that bias the OLS estimates in either direction. For example, if political violence triggers the incumbent government to enact policies to discriminate against former combatants, the OLS estimates are biased upward due to reverse causality. Or if the government pre-emptively embraces

the group that is suspected of having incited conflicts, it understates the OLS estimates due to joint determination. The best way to resolve the endogeneity issues is to use an instrument. Such an instrument should be a critical determinant in explaining the variation of the endogenous variable – income inequality– and affects the onset of civil conflict only through the inequality. The following two sections will statistically substantiate the validity of instrument and the causality of 2SLS estimates.

5.1.2 Reduced Form Estimates

Panel B in Table 3 shows the estimates of reduced form in equation (10). To document the validity of the instrument, the relationship between instrument and conflict should be significant as hypothesis 1.b states. More importantly, ϵ_{ct} in equation (12) should be uncorrelated with the instrument. The latter condition is called exclusion restrictions, which implies that exogenous instrument has an effect on civil conflict only through inequality, but not through any other omitted channels that ϵ_{ct} contains.

The reduced form estimates with fixed effects in columns (4) to (6) show the statistically significant relationship between instrument and conflict (p-value is 0.0501). As the instrument consists of the relative abundance of land to labour and trade openness, the positive and statistically significant coefficients of reduced form estimates prove hypothesis 1.b: land-abundant countries with liberalized economic policies experience more internal conflicts.

In contrast to the first condition, the exclusion restrictions of the instrument cannot be proven with statistical models. Thus, this paper strategically designs the identification estimations and chooses the measures of the instrument to maximize the exogeneity of instrument. As discussed in section 3, the first concern applies to temporal variation of tariffs from 1988 to 2015 that is parallel with other prominent global political changes. Since democratization came to third world countries in a period of economic liberalization, the significant relationship between instrument and conflict can be spurious driven by confounding factors. To address this concern, this study controls for various time effects. Note that any global time trend regardless of its differentiated extent to each country is captured by year-fixed effect and country-specific time trends. By employing these effects, this study can isolate the tariff variation uncorrelated with concurrent events. The second concern arises from factor endowments because civil conflict might affect to land-labour ratio, not vice versa. For instance, the conflict would reduce the numbers of workers by increasing unemployment, and temporary cultivable land would be destroyed in a civil war. As stated in section 4, to resolve these issues, this paper includes potentially cultivable areas in addition to areas under cultivation to measure the total land endowment. Likewise, this

Table 3: *The Effect of Inequality on Civil Conflict*

	Without Fixed effect			Baseline Specification		
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	Civil Conflict Onset					
Panel A: OLS estimates						
Gross Income Inequality	0.064	-0.016	-0.029	0.190	0.179	0.458
	(0.048)	(0.051)	(0.064)	(0.292)	(0.376)	(0.416)
R-squared	0.001	0.023	0.036	0.190	0.202	0.249
Panel B: Reduced Form						
Factor Endowments x (1/tariff)	-0.019***	-0.006	-0.0005	0.010*	0.022*	0.021*
	(0.006)	(0.008)	(0.008)	(0.006)	(0.012)	(0.011)
R-squared	0.00004	0.023	0.040	0.185	0.170	0.205
Panel C: SLS estimates						
Gross Income Inequality	0.738*	-0.009	0.012	0.631*	1.806**	1.791**
	(0.420)	(0.107)	(0.110)	(0.371)	(0.784)	(0.745)
R-squared	-0.151	0.021	0.042	0.191	0.164	0.173
Dependent variable:	Gross Income Inequality					
Panel D: First Stage estimates						
Factor Endowments x (1/tariff)	-0.0207***	-0.0666***	-0.0783***	0.0187***	0.0173***	0.0174***
	(0.0077)	(0.0109)	(0.01482)	(0.0009)	(0.0013)	(0.0014)
Kleibergen-Paap F-statistic	5.517	46.31	27.63	311.5	190.1	173.2
Controls (for all panels):						
Log GDP per capita		-0.0326***	-0.03391***		-0.0089*	-0.0103*
		(0.0041)	(0.00494)		(0.0047)	(0.0054)
GDP growth rate x 1000		-0.9	-1.65		0.0443	0.064
		(1.00)	(1.18)		(0.1241)	(0.133)
Fuel export (percent GDP)		0.001	0.0003		0.002	0.003
		(0.004)	(0.0005)		(0.019)	(0.010)
Foreign direct investment		-2.96e-13	-2.20e-13		1.43e-15	-4.08e-15
		(1.44e-13)	(1.77e-13)		(1.44e-14)	(1.58e-14)
Total resource rent (percent GDP)		0.0008	-0.0008		-0.0005**	-0.0006***
		(0.0011)	(0.0013)		(0.0002)	(0.0002)
Polity score		0.0029**	0.0037***		-0.0002	-0.00060
		(0.0012)	(0.0013)		(0.0004)	(0.0007)
Log total population		0.0012	0.0010		0.0757*	0.0552
		(0.0043)	(0.00621)		(0.0387)	(0.0547)
Population density		0.00001*	-0.00009**		4.15E-06	6.1E-06
		(6.16e-06)	(0.00004)		(7.51e-06)	(0.000303)
Log Mountainous terrain			0.0138**			
			(0.005)			
Ethnic Fractionalization			0.0501*			
			(0.028)			
Primary Education						0.0001
						(0.00011)
Number of countries	147	125	106	147	125	111
Observations	2,297	1,945	921	2,297	1,945	1,477
Capital Contrl	YES	YES	YES	YES	YES	YES
Country FE	NO	NO	NO	YES	YES	YES
Year FE	NO	NO	NO	YES	YES	YES
Country Specific Time Trend	NO	NO	NO	YES	YES	YES

Notes: Robust standard errors in parentheses. All standard errors are clustered at country level.
*** p<0.01, ** p<0.05, * p<0.1

paper measures labour endowment with the total working age population, rather than labour population that corresponds to market demand.

Nevertheless, some might argue that excluded variables in the estimation would bias the estimates. In other words, omitted variables that ϵ_{ct} contains are stronger to explain the relationship between instrument and conflict than the included covariates. In this case, the estimates of reduced-form would not be reliable even though the instrument is uncorrelated with omitted variables. To examine this possibility, this paper uses a test suggested by Altonji et al (2005). This test assesses the bias based on measuring the ratio of the unobservable to the observable. If the absolute value of ratio is less than 1, the unobservable is stronger than observable to explain the estimates. The ratio is generated by comparing the coefficient of full set of controls ($\hat{\beta}^F$) in column (6) and restricted set ($\hat{\beta}^R$) in column (4). As $\hat{\beta}^F / (\hat{\beta}^R - \hat{\beta}^F)$ is greater than 1 (i.e., $0.21/0.11 \approx 1.91$), the estimates of the reduced-form with various fixed effects are not driven by the unobservable.[10]

5.1.3 First Stage Estimates

Panel D in Table 3 presents the estimates of the first stage, testing hypothesis 1.a which postulates that the relative land abundance together with open trade are good predictors of higher income inequality. This instrument relevance is another condition to substantiate the validity of the instrument, along with the instrument exogeneity and the exclusion restriction discussed in the reduced-form estimation. The more the instrument (i.e., the factor endowments and tariff) explains the variation of the endogenous variable (i.e., income inequality), the more consistent and unbiased 2SLS estimates are derived.

The first stage estimates with fixed effects in columns (4) to (6) show that the relative land abundance and trade openness are very strong determinants of higher income inequality. The coefficients of the instrument are significantly different from zero at the 99 confidence level, confirming hypothesis 1.a that reflects the systemic effect of trade on income distribution conditional on factor endowments. The estimates of the first stage indicate that a one standard deviation increase in the instrument (the interaction of relative abundance of land to labour and the inverse number of tariff) raises the inequality by 0.007 standard deviation. In more practical terms, the case of Nigeria provides a good example to describe the results of the first stage. Nigeria integrated into the global economy in late 1980s by lowering its tariff rate. As a land-rich country, Nigeria developed land-intensive sectors to promote exports. However, access to land ownership is restricted and the creation of quality jobs in the agricultural sector cannot keep up with the

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[10]This can apply to all the other estimates to check the bias of the unobservable: the ratio of the first-stage estimates is 13.4 and the ratio of the 2SLS estimate is 1.5. Thus, all estimates are not biased by the unobservable.

increase in the young population (Adesugba & Mavrotas, 2016). As a result, Nigeria's structural change driven by international trade has failed to provide a sufficient source of income to working age labourers while trade benefits disproportionally accrue to the limited numbers of the land owners, exacerbating uneven distribution of individual wealth. Though not every country follows the Heckscher-Ohlin theorem to transform its industrial structure, the very small standard errors in columns (4) to (6) indicate that the factor endowments and trade openness are important factors in accounting for the inequality variation.

Further, the F statistic of the first stage also documents strong explanatory power of the instrument on inequality. As shown in panel D in Table 3, the F statistic of the first stage ranges from 173.2 to 311.5, which are well above 10. Since Stock and Young (2005) proposed the F statistic of the first stage, which is below 10, as a method for detecting a weak instrument, the results of F-statistics in columns (4) to (6) prove that the present instrument produces consistent and unbiased 2SLS estimates.

5.1.4 Second Stage Estimates

The 2SLS estimates of equation (12), which represent the causal relationship of interest, are shown in panel C of Table 3. All estimates in the model with fixed effects in column (4) to (6) are positive and statistically significant relationship between inequality and conflict. The results document the first main hypothesis that states that individual income inequality raises the risk of civil conflict.

The estimated magnitude of 2SLS coefficients are much larger than the OLS estimates that are reported in panel A. This suggests that measurement error in inequality variable creates attenuation bias to the OLS estimates. Thus, after solving the endogeneity issues and attenuation bias of the OLS estimates, the 2SLS estimates become more economically meaningful as well as statistically significant. Based on the estimates in column (5), a 1 percentage point increase in income inequality raises the probability of the onset of civil conflict by 1.8 percentage points, which is 40 percent of the sample mean.

To interpret the size of causal impact of inequality in more practical terms, this study compares two countries, Tanzania and Pakistan whose level of inequality in 2000 is similar to the world average (0.384) but ended in different level of inequality after 10 years. In 2010, Tanzania became a more unequal society, where Gini coefficient is raised by 5 percentage points (0.434), while Pakistan reduced the inequality by 1.5 percentage points (0.359). If assuming that other determinants hold constant, the result implies that Tanzania becomes 2.6 times riskier country than Pakistan in 2010, which used to have the same expected risk of civil conflict 10 years ago.

To assess the plausibility of this magnitude, I compare the size of IV estimates from the literature. The study by Miguel, Satyanath and Sergenti (Miguel et al., 2004), apparently the only paper that identifies economic causes of conflict using an instrumental variables approach, finds that a 1 percentage point decline in the growth rate leads to 3.15 percentage points increase in the onset of civil war, 45 percent of sample mean.[11] In standard deviation terms, the size of causal impact of economic growth on conflict onset is similarly interpreted with that of inequality: a one standard deviation decrease in economic growth raises the probability of civil war by 0.9 standard deviation, whereas a one standard deviation increase in income inequality increases the risk of conflict by 0.74 standard deviation. As 2SLS estimates of both studies show the similar effects, the magnitude of this study's estimates is within the boundary of causal impact in the literature.

5.1.5 Robust Check: Alternative Specifications

Table 4 shows the estimates of alternative specifications that examine the robustness of the findings in the previous section. The specifications modify the measures of outcome or explanatory variables, and restricts the sample to non-Western countries or low income countries. All of the results are predicted to be consistent with those of the baseline.

The specification in column (2) uses battle deaths as a measure of the outcome variable that has larger variation than the onset of civil conflict of the baseline estimation. As shown in panel C of column (2), the coefficient of 2SLS estimate is 0.7 and statistically significant. This implies that at the sample average, if inequality is raised by 10 percentage points, the country will lose three more lives to internal conflict. The results not only confirm the motivating effect of inequality but also reveals that inequality leads to more intensive combat.

Column (3) reports estimates that use net income inequality, another representative measure of income inequality, instead of gross income inequality. As this indicator is based on income how much the individual can consume rather than how much s/he earns, it directly reflects the benefits of productive activities that individual considers to calculate her/his opportunity cost of fighting (Deininger & Squire, 1996). However, the instrument (i.e., relative abundance land to labour and trade openness) cannot explain the variation of the net income inequality since the income is deducted by tax or transfer. The results of column (3) are consistent with the prediction. As shown in panel D, the estimate of the first stage is lower in magnitude and the F-statistics is reduced to 29.07 from 190.1, implying that the instrument accounts the net income inequality

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[11]This result is reported in the Table 6 (p.744). Since the authors do not provide the detailed interpretation of the magnitude, I interpret the coefficient referring to the descriptive statistics (p.732).

Table 4: *The Effect of Inequality on Civil Conflict: Alternative Specifications*

		Alternative Specification			
	Baseline (1)	Battle Death (2)	Net Income (3)	Non-Western (4)	Low income (5)
Dependent variable:					
Panel A: OLS estimates					
Gross Income Inequality	0.179	-0.255		0.296	0.381
	(0.376)	(0.249)		(0.487)	(0.535)
Net Income Inequality			0.342		
			(0.253)		
R-squared	0.202	0.807	0.206	0.208	0.215
Panel B: Reduced Form					
Factor Endowments x (1/tariff)	0.022*	0.012**	0.022*	0.028**	0.029*
	(0.012)	(0.005)	(0.012)	(0.013)	(0.015)
R-squared	0.170	0.815	0.170	0.177	0.181
Panel C: SLS estimates					
Gross Income Inequality	1.806**	0.704**		2.198***	1.979**
	(0.784)	(0.337)		(0.828)	(0.802)
Net Income Inequality			2.830**		
			(1.435)		
R-squared	0.164	0.828	0.139	0.173	0.182
Dependent variable:					
Panel D: First Stage estimates					
Factor Endowments x (1/tariff)	0.017***	0.017***	0.009***	0.018***	0.019***
	(0.001310)	(0.001310)	(0.001850)	(0.001412)	(0.001528)
Kleibergen-Paap F-statistic	190.1	190.1	29.07	173.2	155.7
Controls (for all panels):					
Log GDP per capita	-0.008869*	-0.008869*	-0.011717*	-0.006568	-0.001775
	(0.004685)	(0.004685)	(0.006316)	(0.005322)	(0.004776)
GDP growth rate x 1000	0.000044	0.000044	0.000046	0.000008	-0.000131
	(0.000124)	(0.000124)	(0.000163)	(0.000127)	(0.000145)
Fuel export (percent GDP)	0.002	0.002	0.021	-0.038	-0.003
	(0.098)	(0.098)	(0.131)	(0.095)	(0.093)
Foreign direct investment	1.43e-15	1.43e-15	2.31e-14*	-5.31e-14**	-6.57e-14*
	(1.44e-14)	(1.44e-14)	(1.39e-14)	(2.09e-14)	(3.52e-14)
Total resource rent (percent GDP)	-0.000466**	-0.000466**	-0.000315	-0.000382*	-0.000389**
	(0.000191)	(0.000191)	(0.000259)	(0.000200)	(0.000183)
Polity score	-0.000249	-0.000249	-0.000500	-0.000390	-0.000297
	(0.000409)	(0.000409)	(0.000574)	(0.000401)	(0.000396)
Log total population	0.075686*	0.075686*	0.015674	0.052311*	0.021386
	(0.038747)	(0.038747)	(0.051011)	(0.028011)	(0.045941)
Population density	0.000004	0.000004	-0.000009	0.000009	0.000112
	(0.000008)	(0.000008)	(0.000010)	(0.000007)	(0.000165)
Number of countries	125	125	125	104	104
Observations	1,945	1,945	1,891	1,451	1,275
Capital Contrl	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Country Specific Time Trend	YES	YES	YES	YES	YES

Notes: Robust standard errors in parentheses. All standard errors are clustered at country level.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

variation less than the gross income inequality. Panel C shows the 2SLS estimate is larger than of baseline estimate, indicating a larger causal impact of disposable income inequality on civil conflict than the pre-tax income inequality.

Columns (4) and (5) present the results of alternative specifications restricting the sample. The estimation of column (4) excludes countries in Europe and North America that have good buffering institutions that allow individuals to express their discontent through nonviolent channels. The results of column (4) show that estimate of the reduced form is statistically more significant and larger in magnitude than that of estimation with whole world sample. In addition, the causal impact of inequality is increased by 22 percent of the baseline estimate. This implies that the natural condition that is prone to make the country highly unequal (i.e., high abundance of land compared to labour) can have a positive and stronger effect on civil conflict if the countries have less effective institutions in diluting social discontent.

Column (5) reports the results of estimations with low-income countries. Having discussed in the conceptual framework of the mobilizing effect of inequality, the individuals allocate their time to conflictual activities only when their wage rate is lower than the compensating rate. The compensating rate is mostly similar across countries since the level is determined to maintain the rebellious organization – providing free meals, weapons and transportation. Thus, the threshold to recruit combatants is determined by the minimum wage rate. From this angle, it can be inferred that individuals in wealthy countries are more likely to be paid more than the compensating rate; however, those in poor countries, even if the countries are more egalitarian, are more likely to be paid less than the compensating rate. Thus, the causal effect of inequality in low income countries will be more pronounced. As predicted, the 2SLS estimate of income inequality is increased by 10 percent and statistically significant.

Overall, the alternations in key variables or the range of sample generate the same finding that highly unequal countries experience more civil conflict. In addition, the estimates are changed consistently as the presumptions predict. Therefore, the results, which are not only statistically significant but also theoretically consistent, document the robustness of the causal estimates of inequality on civil conflict.

5.1.6 Falsification Test

In section 5.1.2, this paper introduces identification strategy that controls for spurious time trend to satisfy the exclusion restriction condition of instrument. The falsification test examines additionally if the identification fully addresses the source of confounding factors. The panel A of Table 5 shows the estimates of the reduced-form equation. Except the column (4) of which

equation examines the relationship between a tariff rate and civil conflict in the same year, other equations examine the relationship between a tariff rate in different years from those the conflict is occurred. If the variation of civil conflict is explained by a tariff rate, rather than it is confounded by spurious time trend, the tariff rate in lagged or lead years should not have statistically significant relationship with the conflict.

Panel A of columns (1) to (3), and column (5) to (7) report the relationship between civil conflict in year t and a tariff (interacted with factor endowments in year t) in the preceding and lagged years, respectively. Unlike the reduced-form estimate of baseline in column (4), all estimates are statistically insignificant. Further, the coefficient of 2SLS estimated by a tariff in leads or lagged years become indistinguishable from zero and the magnitude of F-test is smaller. The results confirm that the tariff rate drives the time variations of internal conflicts within the country.

Table 5: *Falsification Test*

	(1) tariff, t-3	(2) tariff, t-2	(3) tariff, t-1	(4) tariff, t	(5) tariff, t+1	(6) tariff, t+2	(7) tariff, t+3
Dependent variable:				Civil Conflict Onset			
Panel A: Reduced form estimates							
Factor Endowments x (1/tariff)	-0.005	-0.006	-0.002	0.023*	0.005	0.002	0.011
	(0.017)	(0.020)	(0.014)	(0.012)	(0.013)	(0.019)	(0.023)
Panel B. 2SLS estimates:							
Gross Income Inequality	-3.373	-1.575	-0.952	1.806**	2.362	1.928	-4.410
	(2.051)	(1.766)	(1.374)	(0.784)	(2.459)	(2.940)	(3.503)
R-squared	0.223	0.209	0.228	0.164	0.215	0.206	0.153
KP F-Stat	17.65	57.64	66.15	190.1	21.19	22.18	18.30
Observations	1,672	1,707	1,730	1,736	1,672	1,610	1,548
R-squared	0.251	0.214	0.224	0.171	0.202	0.211	0.209
Capital Contrl	YES	YES	YES	YES	YES	YES	YES
Other Controls	YES	YES	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES
Country Specific Time Trend	YES	YES	YES	YES	YES	YES	YES

Notes: Robust standard errors in parentheses. All standard errors are clustered at country level.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

5.2 Estimates of the Mobilizing Effect of Inequality

5.2.1 Identifying the Subject and Channel of Conflict Initiation

This paper conducts a subgroup analysis to identify the subject who is motivated to fight and the channel by which the motivated individuals use to mobilize collective violence. The conceptual frameworks specify that individuals marginalized in the labour market are the agent initiating conflict due to higher inequality, and designate an ethnic group as a channel that facilitates organizing a rebellion. However, these assumptions have not been proven by the previous findings of cross-country analysis. The analysis only provides circumstantial evidence at the country level: the country with higher inequality experiences more internal conflicts. Thus, by undertaking the subgroup analysis, this paper examines whether differential effects of inequality exist depending on specific context of the country. If the causal effect of inequality is pronounced in a country with a high unemployment rate or a high ethnic fractionalization, the results support the assumptions of the conceptual frameworks.

Table 6 reports the estimates. Columns (2) and (3) examine the heterogeneous causal effect of inequality on civil conflict depending on the employment rate. As indicated in panel A in column (2), the size of the 2SLS estimate in countries with a low employment rate is increased by 51.67 percent, compared to that of baseline (from 1.806 to 2.732). The magnitude of the reduced-form coefficient are substantially larger, risen by 263 percent of baseline estimate(from 0.022 to 0.080); further, the estimate is more precisely measured at 95 confidence level. Particularly in non Western countries with low employment rate, the causal effect of income inequality on conflict is remarkable. The point estimates of an instrumental variable is almost doubled (from 1.806 to 2.540) and the size of the reduced-form coefficient increases fourfold (from 0.022 to 0.093). However, the significance and substance of causal effect of inequality is disappeared in the country with high employment rate as indicated in column (3), which is consistent even after excluding countries in Western Europe and North America. This striking contrast implies that the unemployed might serve as an agent to precipitate conflict.

Columns (4) and (5) show the heterogeneous effects of inequality on conflict conditional on the level of ethnic fractionalization. As reported in column (5), if the country is ethnically diverse, the causal impact of inequality is stronger than that of baseline (from 1.806 to 2.364). This causal relationship becomes even more striking if developed Western countries are excluded. The magnitude of the 2SLS estimate becomes 1.8 times greater than baseline estimate (from 1.806 to 3.304), and the point estimate is statistically more precisely predicted at the 95 percent confidence level. The reinforcing effect in the ethnically fractionalized context is consistently shown in the

Table 6: *Subgroup Analysis*

	Baseline	Employment rate (15-64)		Ethnic Fractionalization	
	(1)	(2)	(3)	(4)	(5)
Intensity (Low < Median < High)		Low	High	Low	High
Dependent variable:			Civil Conflict Onset		
Panel A: 2SLS estimates					
Gross Income Inequality	1.806**	2.737**	0.738	-1.528	2.364*
	(0.784)	(1.339)	(2.752)	(1.498)	(1.243)
R-squared	0.164	0.209	0.262	0.167	0.222
KP F-Stat	190.1	56.24	1.166	2.243	73.70
Panel B: Reduced form					
Factor Endowments x (1/tariff)	0.022*	0.080**	-5.910	6.723	0.042*
	(0.012)	(0.032)	(6.194)	(10.433)	(0.023)
Number of countries	125	69	70	54	56
Observations	1,945	928	961	1,123	797
R-squared	0.170	0.212	0.262	0.192	0.211
Capital Contrl	YES	YES	YES	YES	YES
Other Controls	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Country Specific Time Trend	YES	YES	YES	YES	YES
		Samples exl. Western Europe and North America			
Panel C: 2SLS estimates					
Gross Income Inequality	2.198***	3.540**	-0.143	-0.852	3.304**
	(0.828)	(1.454)	(3.403)	(2.957)	(1.337)
Observations	1,451	643	640	673	619
R-squared	0.173	0.215	0.273	0.213	0.226
KP F-Stat	173.2	62.93	1.241	1.681	53.92
Panel D: Reduced form					
Factor Endowments x (1/tariff)	0.028**	0.093**	-8.928	-1.574	0.058**
	(0.013)	(0.035)	(8.730)	(23.631)	(0.024)
Number of countries	104	55	57	39	52
Observations	1,451	722	741	766	706
R-squared	0.177	0.217	0.272	0.219	0.224
Capital Contrl	YES	YES	YES	YES	YES
Other Controls	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Country Specific Time Trend	YES	YES	YES	YES	YES

Notes: Robust standard errors in parentheses. All standard errors are clustered at country level.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

reduced-form estimation. It becomes if comparing the estimates for less ethnically divided country as indicated in column (4). In the countries with low ethnic diversities, the income inequality does not have any influence on the likelihood of civil conflict. The coefficient of the causal estimate of inequality, as reported in panel A, is negative and statistically insignificant. Even after excluding countries in Western Europe and North America, the statistically indistinguishable results are not changed.

Overall, the subgroup analysis identifies that the individuals marginalized in the labour market are more likely to be the subject to fight; and ethnicity could be a channel that mobilizes a collective violence. Connecting these results with the findings of cross-country analysis, we can infer that it is the unemployed who are motivated to trigger the conflict and an ethnic group to which they belong serves as tool to mobilize collective action if inequality goes up. The next section explores the mechanism by which the unemployed facilitate internal conflict through their ethnic group.

5.2.2 Within-Ethnic Group Inequality and the Conflict Initiation

Having identified that the unemployed and ethnic group are the agents of conflict initiation at the individual and group level respectively, this paper examines whether the increase in the unemployed within the ethnic group breeds more internal conflicts incited by the group. This analysis tests the second hypothesis, postulating that the ethnic group with higher within-group inequality is more likely to precipitate civil conflict. Note, as conceptual frameworks describe, an increase in the number of the unemployed of an ethnic group reflects within-group inequality if the total wealth of the group is constant. This is because a negative shift in the distribution of labour leads the most marginalized people to be unemployed; however, the constant aggregate wealth implies that income loss of the unemployed is compensated by the income gain of the capital or land owners who are rarely affected by the labour market.

Table 7 provides results of baseline estimation of equation (13). As previously explained, the coefficient of unemployment represents the effect of within-group inequality on civil conflict as far as the equation includes the ethnic-level wealth as a covariate. To measure the total wealth of the ethnic group, column (1) includes the average of GDP of the ethnic group from 1995 to 2005, which partially covers the observation period due to data availability. To compensate for this limitation, I use the aggregated emission of night light in the residential area of the ethnic group as a substitute measure of the group's wealth in columns (2). Then, to check the robustness of estimate, column (3) includes both measures for total wealth of ethnic group. The estimation without religion fixed effects in columns (1) to (3) provides consistent results. All of the

Table 7: *Ethnic-level Baseline Specification*

	Without Religion Fixed Effect			Baseline Specification		
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	Average of Conflict Initiation from 1988-2015					
Unemployment	0.131*	0.132*	0.135*	0.237***	0.237***	0.233***
	(0.065)	(0.066)	(0.068)	(0.075)	(0.076)	(0.062)
GDP of ethnic group	5.22e-06		-0.0001	0.00003*		0.00016
	(6.33e-06)		(0.0016)	(0.000013)		(0.0027)
Night Light		8.68e-10	1.31e-08		3.75e-09*	-2.18e-08
		(1.01e-09)	(2.45e-08)		(2.00e-09)	(4.24e-08)
Rural residence	0.015	0.016	0.014	0.032	0.031	0.039
	(0.014)	(0.014)	(0.015)	(0.026)	(0.026)	(0.034)
Age	0.002	0.002	0.002	0.010	0.010	0.010
	(0.002)	(0.002)	(0.002)	(0.007)	(0.007)	(0.007)
Sex	-0.034	-0.038	-0.038	0.060	0.055	0.042
	(0.128)	(0.130)	(0.129)	(0.199)	(0.207)	(0.217)
Literacy	-0.015	-0.014	-0.013	-0.009	-0.008	-0.008
	(0.022)	(0.021)	(0.022)	(0.043)	(0.043)	(0.043)
Years of education	0.018	0.018	0.017	0.036	0.034	0.036
	(0.017)	(0.017)	(0.017)	(0.026)	(0.026)	(0.026)
Martial status	-0.069	-0.071	-0.068	-0.244	-0.244	-0.274
	(0.084)	(0.085)	(0.088)	(0.147)	(0.152)	(0.181)
Number of child	0.019*	0.019*	0.019*	0.058**	0.058**	0.059**
	(0.010)	(0.010)	(0.010)	(0.022)	(0.022)	(0.022)
Population	2.2e-10	1.84e-10	5.53e-10	1.95e-09	2.12e-09	1.36e-09
	(1.44e-09)	(1.43e-09)	(1.42e-09)	(2.25e-09)	(2.20e-09)	(2.78e-09)
Proportion of Population	-0.014	-0.013	-0.015	-0.029	-0.029	-0.025
	(0.010)	(0.010)	(0.011)	(0.019)	(0.020)	(0.024)
Observations	94,068,879	94,068,879	94,068,879	85,125,936	72,483,049	72,483,049
Included ethnic groups	144	143	143	85	84	84
R-squared	0.452	0.452	0.455	0.555	0.553	0.559
Religion FE	NO	NO	NO	YES	YES	YES
Country FE	YES	YES	YES	YES	YES	YES

Notes: Robust standard errors in parentheses. All standard errors are clustered at country level.
*** p<0.01, ** p<0.05, * p<0.1

estimates of unemployment are positive and statistically significant at the 90 percent confidence level. These estimates are barely affected by alternative measures and maintain its magnitude and significance.

To capture the genuine effect of ethnicity, columns (4) to (6) add religion fixed effect. The common religion networks that exist within and across ethnic groups provide additional channel for motivated individuals to facilitate collective violence, leading to underestimate the mobilizing effect of the ethnic group. As shown in columns (4) to (6), the inclusion of religion fixed effect makes the effect of unemployment statistically larger and economically more meaningful. In case of ethnic group with mean value, a 10 percent increase in the unemployment rate of the group leads to the increase of probability of triggering internal conflict by 0.2 percentage points, which is 55 percent of sample mean. Moreover, if the total wealth of ethnic group is increased

Table 8: *Ethnic-level Alternative Specification*

	Baseline	Alternative Specification			
	(1)	(2)	(3)	(4)	(5)
Dependent variable:	Average of Conflict Initiation from 1988-2015				
Unemployment	0.237***	0.156***			
	(0.076)	(0.048)			
GDP of ethnic group	0.00003*		4.23e-06		0.002
	(0.0027)		(0.000013)		(0.00034)
Night Light				2.49e-10	-2.97e-08
				(3.09e-09)	(5.67e-08)
Rural residence	0.032	0.036	-0.008	-0.008	0.003
	(0.026)	(0.023)	(0.028)	(0.027)	(0.030)
Age	0.010	0.003	0.005	0.005	0.006
	(0.007)	(0.004)	(0.004)	(0.004)	(0.005)
Sex	0.060	0.115	0.082	0.079	0.063
	(0.199)	(0.107)	(0.226)	(0.235)	(0.233)
Literacy	-0.009	-0.004	-0.046	-0.046	-0.045
	(0.043)	(0.029)	(0.057)	(0.058)	(0.056)
Years of education	0.036	0.030	0.051	0.050	0.052
	(0.026)	(0.018)	(0.032)	(0.032)	(0.034)
Martial status	-0.244	-0.078	-0.267	-0.271	-0.305
	(0.147)	(0.104)	(0.164)	(0.170)	(0.217)
Number of child	0.058**	0.021	0.079**	0.079**	0.079**
	(0.022)	(0.020)	(0.032)	(0.031)	(0.030)
Population	1.95e-09	1.99e-09	2.35e-09	2.48e-09	1.57e-09
	(2.25e-09)	(1.55e-09)	(2.64e-09)	(2.71e-09)	(2.80e-09)
Proportion of Population	-0.029	-0.028*	-0.032	-0.032	-0.028
	(0.019)	(0.015)	(0.022)	(0.022)	(0.025)
Observations	85,125,936	72,802,213	85,125,936	72,483,049	71,777,299
Included ethnic groups	85	98	85	84	84
R-squared	0.555	0.450	0.490	0.490	0.498
Religion FE	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES

Notes: Robust standard errors in parentheses. All standard errors are clustered at country level.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

by 10 percent, the probability of initiating conflicts is risen by 0.02 percentage points that amount to 5 percent of sample mean. In sum, the results in Table 7 suggest that the increase in the heterogeneity of wealth within the ethnic group facilitates conflict more effectively by supplying conflict labour from the unemployed and the finance from the rich, as the second hypothesis predicts.

In addition, to specify the effect of within-group characteristics on conflict initiation, this paper decomposes the previous model. The alternative specifications that measure each effect of the unemployment rate and total wealth of the ethnic group separately are reported in Table 8. As shown in column (2), without the aggregate wealth of ethnic group controls, there is still a positive and statistically significant association between unemployment and conflict initiation, although the size of the coefficient is reduced by 34 percent. Comparing to the baseline specification's

finding that shows positive effects of the unemployed and the total wealth controls, the results imply that the conflict-mobilizing effect of the conflictual labour supply –proxied by the portion of the unemployed– is reinforced if the unemployed are members of wealthy ethnic group.

In contrast, columns (3) to (5) show that the aggregate wealth of the ethnic group does not affect to the likelihood of conflict initiation. The non-finding has two implications. First, the finance to mobilize collective action becomes a necessary condition only if the supply of conflictual labour exists. Second, it suggest that the horizontal inequality hypothesis might not be unreliable. The horizontal inequality literature focusing on intergroup inequality as a cause of conflict argues that the more economically deprived ethnic group is more likely to be motivated to fight and mobilize collective action. With country fixed effect, the average of the aggregate ethnic wealth from 1988 to 2015 reflects the ethnic group's relative level of wealth compared to other ethnic groups residing in the same country. Thus, if the horizontal inequality hypothesis is correct, the coefficients of the variables related to total wealth of ethnic group should be negative and statistically significant. However, none of ethnic wealth estimates are precise enough to be statistically different from zero. The results reveal the importance of resource for mobilizing collective action, which is distinguishable point of within-group inequality hypothesis.

Overall, the analysis on within-ethnic group characteristics documents association between within-ethnic group inequality and conflict initiation. As described in the conceptual frameworks of the mobilizing effect of within- group inequality, the polarization of wealth within the ethnic group contributes to mobilizing the conflict since the richer provide more finance for operating and maintaining the rebellion and the poorer contributes to supplying more the conflictual labour. This synergy of finance and labour serves as the mobilizing force of collective violence.

6 Conclusion

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Appendix A   Theoretical Model of Mobilization

Applying Esteban & Ray (2011)'s model of ethnic conflict, this paper extends time line of utility and choices for individual behaviour. Unlike the opportunity cost approach that includes the expected relative returns of civil conflict, the individual in this model additionally considers the present utility of participating into the rebellion. Moreover, a monetary contribution to finance militant activity is included as another choice besides a physical contribution (i.e., allocated time for the conflict labour). By including the present utility based on the available finance, this model can contain the interim process of mobilization before the breakout of conflict: how the motivated, but poor individuals maintain and operate the militant organization.

As shown in equation (6), Esteban & Ray (2011)'s model consists of two parts: the expected utility of participating in rebellion relative to productive activities and the present utility of allocating time or contributing money to rebellion relative to the wage from the productive activities.

W denotes the wining probability function that depends on the conflictual labours and financial contribution to the rebellion, and x denotes the individual's preference on the outcome of the winning. Thus, Wx stands for the utility of expected outcome by joining the rebellion. The rest components of the equation, $u((1-s)P_L + cs - r)$, indicates the present utility that depends on the net income as a result of the present choice between time for conflictual activities (s) and financial contribution (r). As in the section 2.1, P_L indicates the wage rate per unit of time from the productive sectors, (1 - s)P_L is the total income from productive activities. c denotes the compensation rate per unit of time that an individual receives from the rebellion such as free meal, weapon and transportation. Thus, the total income of individual is $(1-s)P_L + cs$ and the net income is $(1-s)P_L + cs - r$ if s/he contributes finance to rebel groups.

Esteban & Ray (2011)'s model assumes that W is a strictly increasing and concave function with respect to the labour devoted to the rebellion.[12] Here, the labourers include not only the labour voluntarily supplied (s) but also the labourers bought by financial contribution: r/c, denoted by d. Moreover, this paper assumes that individual has homogenous preference on the outcome of conflict, x. Then, Wx can be substituted with the individual's expected payoff of fighting in the model of social conflict (Dal Bó & Dal Bó, 2011) in section 2.1, $A(L_A + d)(p_1q_1 + p_2q_2)/L_A$, because $A(\cdot)$ is also increasing and concave function. The only difference is that the conflictual labour is changed to L_A + d that captures financial contribution (r) as the additional supply of conflictual labour (d, which is r/c).

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[12]W in the original model includes participating labours in the opposing sides as well ($\psi(L_{A1})/(\psi(L_{A1}) + \psi(L_{A2}))$, $\psi(\cdot)$ is increasing and concave function); however, this paper considers government army as the only opponent. Thus, if $\psi(L_{A2})$ is fixed, W is increasing and concave function with respect to the conflictual labours.

Due to the absence of the parameter reflecting inequality in equation (6), this study estimates the level of inequality within ethnic group by calculating the change in the number of unemployed while holding the aggregated wealth of ethnic group constant since it implies that the incomes of the marginalized people are transferred to the rich. As the total wealth is constant, the expected total gains from looting, $p_1 q_1 + p_2 q_2$, are also fixed. Under these assumptions, equation (6) is rewritten as follow.

$$\max_{s,d} \frac{A(L_A + d)(p_1 q_1 + p_2 q_2)}{L_A} + u((1-s)P_L + sc - dc) \tag{11}$$

where L_A denotes the aggregated time of conflictual labours by the rest of the individuals in the ethnic group. d denotes the conflictual labour purchased by the individual's financial contribution: r/c. The optimal response of individual, s and d satisfy the following conditions respectively.

$$(c - P_L)u'((c - P_L)s + P_L - dc) \leq 0 \tag{12}$$

$$\frac{A'(L_A + d)(p_1 q_1 + p_2 q_2)}{L_A} \leq cu'((c - P_L)s + P_L - dc) \tag{13}$$

Since $A(\cdot)$ and $u(\cdot)$ are increasing and concave, the derivatives are always greater than 0 and have smaller values as the parameter increases. Thus, the best response of s (i.e., allocated time for conflictual activities) in equation (8) is conditional on the relative magnitude of compensation rate and wage rate (c/P_L). If the compensation rate from the conflictual activities is greater than the wage rate from productive activities (c/P_L > 1), the time devoted to rebel (s) reaches the upper bound of time for conflictual activities, $\bar{s}$, while it becomes 0 if the wage rate is greater than the compensation rate (c /P_L < 1). As shown in equation (9), the optimal response of d (i.e., the financial contribution) is conditional on s if the wage rate is lower than compensate rate. However, if the wage rate is greater than compensate rate, the best response is to maximize d in any range of s.

In sum, the best choices of individuals (s and d) in each condition of c and P_L, are as follows. If the individual has a lower wage rate than a compensation rate (c / P_L > 1), the individual chooses to allocate his/her time to conflictual activities ($\bar{s}$), instead of financial contribution. On the other hand, if the individual has higher wage rate than compensation rate (c /P_L < 1), the best response is to contribute finance instead of time because their physical contribution (s) reduces both of present and future utilities, while financial contribution increases expected gains from war which exceeds the loss of present utility.