The Intergenerational Impacts of War: Bombings and Child Labour in Vietnam

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ABSTRACT While adverse consequences of war for the generation who lived through the conflict have been well documented in the literature, the intergenerational impacts of war have received far less attention. We provide causal evidence on the impact of bombings during the Vietnam War on the prevalence of child labour among second-generation Vietnamese, defined as those born after the Vietnam War. Our preferred results, which instrument for bombing intensity using distance to the 17th parallel north latitude, suggest that a 10% increase in the intensity of bombings generates a 1.9 percentage point increase in the probability that a child worked in the last 12 months. This result is robust to several checks. We examine several potential channels and find that this relationship is mediated through household poverty.

KEYWORDS: conflict; war; child labour; Vietnam

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1. Introduction

The impact of war can be devastating, with consequences that extend far beyond direct injuries and death incurred during the conflict. In addition to injuries and fatalities, war can also impede the rate of economic development for decades (Gates, Hegre, Nygård, & Strand, 2012; Minoiu & Shemyakina, 2014; Moyer, Bohl, Hanna, Mapes, & Mickey, 2019). We examine the intergenerational impact of the Vietnam War by studying the long-lasting impact of the Vietnam War on the prevalence of child labour decades after the war ended. The Vietnam War is recognized as one of the most devastating conflicts since World War II in terms of number of deaths, its duration, and its long-term consequences. There were over six million tons of bombs dropped by the US military during the Vietnam War, which is three times greater than the number dropped during World War II (Miguel & Roland, 2011). An estimated three million Vietnamese lives were lost during the war with several million more injured or maimed; over 25,000 square kilometres defoliated; and a significant portion of the Vietnamese population displaced (Allukian & Atwood, 2000).
To examine the effect of the Vietnam War on child labour, we combine bombing data from Miguel and Roland (2011) with data from the 1997/1998 Vietnam Living Standard Survey (VLSS), which was administered when most second-generation children (i.e., those born after the war) were of schooling age. We follow the existing literature (see, e.g. Edmonds & Pavcnik, 2002) and measure child labour using information on child participation in economic activity. Bombings during the Vietnam War were not random. We instrument for the intensity of bombings using the distance from the district in which the bombing occurred to the 17th parallel north latitude, which is the same identification strategy as employed by Miguel and Roland (2011) in their study of the Vietnam War. The 17th parallel north latitude was established as the border between the former South and North Vietnamese governments as part of the 1954 Geneva Accords and was the location in which bombing was the most intense. As we discuss in more detail below, the location of the border was completely arbitrarily decided and had no economic, political or military significance prior to 1954.

We find that war increases the prevalence of child labour. Our two stage least squares (2SLS) results suggest that a 10% increase in the intensity of bombings generates a 1.9 percentage point increase in the probability that a child worked in the last 12 months. The magnitude of the effect of bombing on child labour differs very little when we employ a number of checks. We also examine several channels through which the Vietnam War could influence the prevalence of child labour and find that household poverty mediates the relationship.

Our study contributes to our understanding of the long-lasting consequences of conflict and the antecedents of child labour in several ways. Our first contribution is to extend our understanding of the intergenerational impact of war, which has not received much attention in the literature. Much of the literature on the impact of war or conflict examines the short-term effects (see, e.g. Mansour & Rees, 2012; Minoiu & Shemyakina, 2014; Shemyakina, 2011). Studies that examine the long-term impacts typically focus on the long-term effects for the generation that were born during, or lived through, the war and do not examine effects on the next generation (see, e.g. Ichino & Winter-Ebmer, 2004; Islam, Ouch, Smyth, & Wang, 2016; Merrouche, 2011; Miguel & Roland, 2011; Shemyakina, 2011; Singhal, 2019; Teerawichitchainan & Korinek, 2012). There are a few exceptions. Examples are Akresh, Bhalotra, Leone, and Osili (2017) for the Nigerian civil war; Islam, Ouch, Smyth, & Wang (2017) for the Cambodian civil war; and Baider et al. (2000) and Major (1996) for the Holocaust. These studies, though, mostly focus just on the education and/or health outcomes for the second generation. To our knowledge, there are no studies that examine the impact of war on the prevalence of child labour decades after the conflict ended.

Our second contribution is to the small literature that has examined the long-lasting impacts of the Vietnam War on various development outcomes (Appau, Awaworyi Churchill, Smyth, & Trinh, 2021; Awaworyi Churchill, Munyanyi, Smyth, & Trinh, 2021; Do, 2009; Miguel & Roland, 2011; Palmer, Nguyen, Mitra, Mont, & Groce, 2019; Singhal, 2019; Vu & Lo Bue, 2019). Miguel and Roland (2011) examine the long-term impact of bombing intensity on economic development in Vietnam. Subsequent studies have focused on long-term effects on agricultural productivity, education and health, including incidence of disability. We differ from most of these studies in that they focus on the impact of bombings on the generation that were directly exposed to the war, while our focus is on the impact of war on those born after the war ended. Vu and Lo Bue (2019), who use parental exposure to the bombing to identify the effect of parental schooling on their children’s educational outcomes, is the only study to examine the impact of the Vietnam War on the generation born after the War concluded. We differ from Vu and Lo Bue (2019) in that we focus on child labour, not schooling.

Our third contribution is to the literature that has examined the causes of child labour. Improving our understanding of the factors that contribute to child labour is important, given the sheer numbers involved and the effect of child labour on loss of human capital and reduced prospects later in life. In 2016, there were 152 million children aged 5–17 years engaged in child
labour; of which, 73 million were involved in hazardous work (ILO, 2017). A large number of children in child labour miss out on school. In 2016, there were 36 million children engaged in child labour who did not attend school (ILO, 2017). To this point, most of the literature on the causes of child labour have focused on contemporary influences (Heady, 2003; ILO, 2004; Ravallion & Wodon, 2000). To our knowledge, there are no studies that have examined the historical antecedents of contemporary child labour in developing countries.

In examining the effect of past conflict on more recent child labour, our approach is consistent with a broader strand of literature in economics that has sought to explain spatial differences in modern-day outcomes with reference to events or values that were formed in the past (Alesina, Giuliano, & Nunn, 2013; Grosfeld, Rodnyansky, & Zhuravskaya, 2013; Jha, 2014). We also explicitly examine the mechanisms through which past conflict influences contemporary child labour.

The remainder of the paper is organized as follows. Section 2 examines the conceptual relationship between war and second-generation child labour. Section 3 discusses the data. Section 4 describes the empirical strategy. Section 5 presents the results. Section 6 concludes.

2. Conceptual relationship between war and second-generation child labour

Conceptually, economic growth, poverty, parental health and human capital represent potential channels through which war should influence second-generation child labour.

2.1. Economic growth

Economic growth is an important channel through which war could influence second-generation child labour. There is a well-established inverse relationship between economic development and child labour (see, Hazan & Berdugo, 2002; Strulik, 2004), but theoretically the effect of war on economic development and growth is ambiguous.

Azariadis and Drazen (1990) predict that negative shocks to capital stock resulting from wars cause conflict traps, leading to long-term economic underperformance. If this is the case, one would expect war to increase the prevalence of child labour. However, in a neoclassical framework, Miguel and Roland (2011) predict that war should only have temporary effects on an economy and that there will be transitory increases in capital accumulation and economic growth in war-affected areas until the steady state is reached.

Yet, even in the best-case scenario, estimates suggest that post-war investments take about two decades to rebuild destroyed physical infrastructure (see, e.g. Brakman, Garretsen, & Schramm, 2004; Davis & Weinstein, 2002; Miguel & Roland, 2011). Besides destruction of physical infrastructure, wars typically undermine institutions which might take much longer than physical infrastructure to repair (Collier, 1999). The breakdown of civil liberties and social order associated with wars also reduce the efficiency of growth-enhancing interventions. An erosion of institutional quality can increase the costs of enforcing contracts and diminish the security of property rights, making it harder to enforce laws designed to protect children from abuse.

2.2. Parental health and human Capital

War has long-term adverse implications for both physical and mental health (Palmer et al., 2019; Singhal, 2019) and loss of human capital for the generation that experienced the war (Weldeegzie, 2017). In order to fund war-related activities, public expenditures from growth-enhancing activities, such as education, are curtailed (Collier, 1999). In cases of civil conflict, such as the Vietnam War, the fighting will often result in the closure of schools (Islam et al., 2016, 2017; Kuzmarov, 2012). Further, families are displaced or forced into refugee camps
during wars, and children, as a result, lose the opportunity for education. When duration of the conflict is long, as with the Vietnam War, the higher the likelihood of disruption to schooling through delaying schooling or dropping out early. As a consequence, many studies show that war has direct costs in terms of loss of education for those growing up during the conflict (Islam et al., 2016; Kecmanovic, 2013; Lai & Thyne, 2007; Merrouche, 2011).

The lack of education for first generation victims of war is likely to have adverse effects on the life trajectory of children in the next generation. Poor health and low levels of human capital impede the ability of adult household members to effectively engage in the labour market. Where adult household members are unable to work, this has been shown to be associated with a higher incidence of child labour (Mont & Nguyen, 2013).

An open question is whether post-war investments in infrastructure will offset the potential negative effects of war on human capital accumulation and health in the long-term (Palmer et al., 2019). Empirical evidence from Germany, Japan and Vietnam supports the view that investment in human capital accumulation and health infrastructure may offset the negative effects of war on health in the long-run at the aggregate level (see, Brakman et al., 2004; Davis & Weinstein, 2002; Miguel & Roland, 2011). But, it is not clear that these results hold at the individual level. Children are more likely to engage in child labour when their parents lack human capital or have persistent medical conditions (Jensen & Nielsen, 1997; Ray, 2002). The literature suggests that the long-lasting impacts of war on development outcomes at the individual level tend to be negative (Brakman et al., 2004; Singhal, 2019). In the Vietnamese case, Miguel and Roland (2011) find that the Vietnam War did not have an enduring effect on several development outcomes at the province and district levels; however, at the individual level, Singhal (2019) reports negative effects of the war on mental health.

Even if economic growth is rapid given post-war investments as neoclassical growth models predict, this does not necessarily translate into beneficial development outcomes for individuals or households that can prevent, or reduce, child labour in the long-term (Adams, 2004; Ravallion, 2001). Tellingly, it is likely that the persistent effects of war on institutional quality are likely to influence child labour across generations. At the individual level, households in which adult members have poorer health, or lower human capital, as a result of the War can be expected to have a higher incidence of child labour.

### 2.3. Poverty

Several studies confirm that conflicts tend to exacerbate poverty and hunger. Civil conflicts in Africa, for instance, have been cited as a major cause of food insecurity by curtailing agricultural production valued at over $120 billion (Messer & Cohen, 2008); thus, exacerbating poverty. Mercier, Ngenzebuke, and Verwimp (2020) found that exposure to the Burundi Civil War exacerbated household poverty and that the channels through which this occurred were destruction of physical capital and via the shift of exposed households out of non-farm employment. Research suggests that it would take four generations for households in poverty to overcome it and its associated consequences, and this is even the case for developed countries (OECD, 2018). Thus, we expect that despite the large post-war investments into agriculture that has been largely successful (Pandey, 2006), the loss in income and associated poverty linked to the Vietnam War is likely to linger at least beyond one generation, influencing the proclivity for children in poorer households engaging in labour (Basu & Van, 1998).

Basu and Van (1998) argue that parents engage their children in labour only if they are poverty-stricken. In a theoretical framework, they present the ‘luxury axiom’, which suggests that parents only send their children to work if the household’s total income from adult wages is very low. Empirically, there is evidence consistent with the luxury axiom in many developing countries, in which poverty and low household income is associated with an increase in child work (see, e.g. Dayioglu, 2006; Kambhampati & Rajan, 2005; Ray, 2000).
2.4. Relevance of type of work

The decision to engage children in work is even more likely when such households are engaged in agricultural work. Over 12 million gallons of Agent Orange chemical was sprayed by the US military during the Vietnam War, resulting in widespread defoliation that temporarily reduced agricultural productivity on over 5 million acres of farmland (Allukian & Atwood, 2000). Because of the preponderance of subsistence agricultural in these parts of Vietnam at the time, the destruction of agricultural land created widespread poverty.

We expect that the impact of the Vietnam War on child labour to be more pronounced for households engaged in agricultural work for two reasons. The first consideration is that the incidence of poverty is likely to be higher in agricultural households. The other reason is that since the adoption of its post-war comprehensive reform program, agriculture has been central to Vietnam’s growth; thus, creating more labour market opportunities in agriculture (Green & Vokes, 1997; Van de Walle & Cratty, 2004). We expect that more opportunities will translate to more children engaging in agricultural labour.

3. Data and variables

We combine data from two sources. The data on child labour come from the 1997/1998 VLSS, which contains information on approximately 2,000 children aged between 6 and 15, an age limit we choose following the international conventions on child labour. We use the 1997/1998 VLSS data because it captures the period when most second-generation children were of school-age, and thus, potentially engaged in child labour.

In order to examine the intergenerational impact of war, we focus on both parents born between 1955 and 1975. The lower bound of 1955 was chosen because the first Indochina war ended in 1954. If we allow the lower bound to be before 1955 we cannot isolate the effect of the Vietnam War. The cut-off 1975 is selected as the end of the Vietnam War. This timeframe ensures that all the children in our sample are offspring of parents who experienced the war.

To measure child labour we use information on whether the child participated in economic activities in the last twelve months before the survey interview date, which is consistent with the existing literature (see, e.g. Edmonds & Pavcnik, 2002). We also consider the types of work in which children might engage; namely, whether a child works outside of the household in a paid job, works for the household in agriculture or works in a household business.

To measure the effect of the war we use Miguel and Roland’s (2011) bombing intensity data, which is the total quantity of bombs, missiles and rockets dropped by the US military per square kilometre in Vietnam between 1965 and 1975. This data is at the district level and provides the total quantity of bombs dropped. Accordingly, one limitation of the data is the inability to capture variation over time given that the quantity of bombs dropped are not disaggregated by year. Additionally, bombing intensity within a district may not vary across communes and, therefore, there is a potential issue of lack of geographical variation at a level lower than the district level. Another limitation is that although the war started earlier, there is no data prior to 1965. We control for covariates that are likely to influence the prevalence of child labour, consistent with existing studies (see, e.g. Afriyie, Saeed, & Alhassan, 2019; Dayioğlu, 2006; Ray, 2002).

We consider economic activity, poverty, parental health and education as potential channels through which bombing intensity could influence child labour. We do not have data on GDP per capita at the district level, so we use district level night time data from Hodler and Raschky (2014) to measure economic activity. This approach is consistent with a number of studies that have proposed the use of night-time light as a measure of economic activity (see, e.g. Doll, Muller, & Morley, 2006; Henderson, Storeygard, & Weil, 2012). The use of night-time light data has an important advantage of being a useful proxy for economic activity at the sub-national level when more conventional income-based data are unavailable, given the established
correlation between night light and GDP (Gibson, Olivia, Boe-Gibson, & Li, 2021). However, it also has a well-known disadvantage when it comes to comparability across countries and over time. This is particularly the case for the Defense Meteorological Satellite Program (DMSP) data, which, it is argued are noisy with coarse resolution and low dynamic range that could lead to measurement error (Abrahams, Oram, & Lozano-Gracia, 2018; Elvidge, Baugh, Zhizhin, & Hsu, 2013; Gibson et al., 2021). These concerns, however, do not pose a problem in our case given that our study focuses on a single country.

We measure household poverty using the multidimensional poverty index (MPI) developed by the Oxford Poverty and Human Development Initiative (Alkire & Santos, 2014). Our measure of poverty is the MPI deprivation score assigned to each household based on the weighted sum of the number of deprivations in the poverty indicators. The dimensions of poverty we consider are education, living standards and health. We apply equal weights to each dimension. The parental health variable, which captures the prevalence of illness, is a binary variable equal to one if at least one parent has been ill in the last 4 weeks. We use two measures of parental education which capture the highest level of education attained by each parent.

As a check on the main results using the 1997/1998 VLSS we also use data for 2002 to 2013 from the Vietnamese module in the Young Lives Survey to examine the robustness of our main results. This is a longitudinal study of childhood poverty across four countries including Vietnam. The Young Lives Survey has the advantage over VLSS that child labour is measured by the number of hours that the child worked in the last 14 days. We use this variable to examine the effect of war on child labour at the intensive and extensive margins.

Table A1, in the Supplementary material, presents summary statistics for all variables used in the main analysis. In our sample, about 34 percent of children reported working in the last twelve months. Working in agriculture was the most common form of child economic activity, followed by working for the household business and working outside the households.

Figures A1 and A2 (Supplementary material) map the intensity of bombings and prevalence of child labour across districts using the VLSS 1997/1998 data. The simple correlation between the intensity of bombing and the prevalence of child labour suggests that the relationship is positive. We find that a 10% increase in the intensity of bombings is associated with a 0.024 percentage point increase in the probability that a child worked in the last 12 months. When we control for the relevant covariates and endogeneity below, we find that these preliminary estimates remain robust, although the magnitude of the coefficients on intensity of bombings increase. The distribution of the year of birth of parents whose children we analyse are in Figure A3 (Supplementary material).

4. Model specification and identification strategy

Estimates of the impact of bombings on the likelihood of child labour will be biased if the bombings were not random. Specifically, if areas with better, or worse, growth prospects, with implications for the prevalence of child labour in the future, were more, or less, likely to be bombed, this will bias the estimates. There is much evidence that US bombing was not random. It is usual to distinguish between the nature of bombing in North Vietnam and in South Vietnam. Bombing in North Vietnam was primarily strategic in nature, focusing on military targets, manufacturing bases and transportation-related targets (Clodfelter, 1995; Miguel & Roland, 2011). Bombing in South Vietnam and in parts of North Vietnam close to the border was deep air support (DAS) or preventative tactical bombing (Miguel & Roland, 2011). While the objective of DAS was to disrupt enemy troop movements and support US ground troop movements, rather than destroy infrastructure, it was still not random. Districts in South Vietnam that were controlled by the North Vietnam army were ten times more likely to be bombed than districts controlled by the South and four times more likely to be bombed than districts that were contested (Kocher, Pepinsky & Kalyvas, 2011).
To what extent did the non-random nature of US bombing target areas with better, or worse, growth prospects? In North Vietnam, strategic bombing was targeted more at areas with better growth prospects that had more industrial plants, infrastructure and transportation capabilities (Cloodefelter, 1995). Some of the poorest regions in Vietnam, which are in the Northwest, were never bombed because of their proximity to China (Miguel & Roland, 2011). In South Vietnam, though, and along the border between North and South Vietnam, there is some evidence that the opposite was the case, with DAS targeting poorer areas which the North Vietnam army used for regroupment (Littauer & Uphoff, 1972).

To address the potential endogeneity that may arise from the non-random nature of US bombing and the potential for this to affect the geographical dispersion of child labour, we use an instrumental variable strategy, described in Equations (1, 2).

\[ CL_{i,j,t} = x_0 + x_1 B_j + x_2 CC_{i,j,t} + x_3 PC_{i,j,t} + x_4 Z_j + \nu_{i,j,t} \]

\[ B_j = \gamma_0 + \gamma_1 D_j + \gamma_2 Z_j + \epsilon_j \]

Equation (1) represents the work status of child \( i \) of birth cohort \( t \) living in district \( j \). \( B_j \) represents bombing intensity in district \( j \); \( CC_{i,j,t} \) represents a vector of child characteristics; and \( PC_{i,j,t} \) represents a vector of parental characteristics. The vector \( Z_j \) captures district-level covariates that reflect district-level socioeconomic conditions, including pre-war population density, average temperature and average precipitation during the Vietnam War. We include other geographical district variables including latitude, proportion of land at different altitudes and the proportion of land in 18 different soil categories. We control for cohort fixed effects, denoted by the year in which child \( i \) was born and province fixed effects to control for time invariant characteristics. In all specifications, we cluster standard errors at the district level.

In Equation (2), the distance from the centroid of district \( j \) to the 17th parallel north latitude, \( D_j \), which was the border between North and South Vietnam, is used as the instrument for the intensity of bombings. This instrument was proposed, and employed, by Miguel and Roland (2011) and was more recently employed by Singhal (2019). The heaviest fighting in the Vietnam War occurred around the border. Hence, the 17th parallel north latitude experienced the heaviest bombing in the Vietnam War, most of which was DAS or preventative tactical bombing designed to disrupt North Vietnamese troop movements. Districts which were closer to the border suffered from higher intensity of bombings, while districts that were further away from the 17th parallel north latitude were bombed less. In Equation (2), our instrument is measured as the absolute value of the distance between the centroid of the district to the 17th parallel. Therefore, the sign on our instrumental variable (\( \gamma_1 \)) is expected to be negative.

The 17th parallel was set in 1954 as the border between North and South Vietnam as a consequence of the Geneve Accord. There are several features of how it was established that suggests that the choice of the 17th parallel as the border in 1954 was completely arbitrary, making it a relevant and valid instrument for our purposes.

First, the location of the border was the product of strategic negotiations between the United States and the Soviet Union in the context of the Cold War. Before the negotiations leading to the Geneve Accord it was not even clear whether Vietnam would be partitioned and, if so, at what parallel the new border would be set. The Soviet Union initially wanted the border established lower at the 13th parallel, while the United States wanted the border higher at the 18th parallel. The choice of the 17th parallel was reached in the Geneve Accord as a compromise between the political ambitions of the two superpowers (Logevall, 2012). Second, the choice of the 17th parallel was made completely independently of local geographical or socio-economic conditions in Vietnam in 1954 and without any consultation with the Vietnamese (Miguel & Roland, 2011). Third, prior to the Geneve Accord, the 17th parallel had no political or military significance. It did not reflect the geographical distribution of political beliefs, with the main
concentration of communists located in the urban and northern parts of the country, near the border with China, which was nowhere near the 17th parallel. Moreover, it had not been a major centre of conflict in the First Indochina War, in which most of the fighting had occurred north of the 21st parallel, again near the border with China (Logevall, 2012).

The main concern for whether the instrument is valid is whether it is correlated with unobserved factors affecting child labour outcomes, violating the exclusion restriction. A possible concern in this respect is that distance from the 17th parallel is negatively correlated with distance of the district to the nearest megalopolis, which are Hanoi and Ho Chi Minh City (Miguel & Roland, 2011; Singhal, 2019). Districts closer to one of the two main cities are likely to have better economic opportunities and infrastructure that are likely to influence child labour outcomes. Thus, people further away from the two major cities are likely to migrate to the nearest city for better economic opportunities. To address this potential concern, we control for distance from each district to Hanoi and Ho Chi Minh City in each specification.

Another potential problem is that migration decisions could be a threat to our identification strategy through endogenous sorting. Households in locations with greater exposure to the war may self-select into locations with better growth prospects in which child labour is less prevalent. To address the potential bias that migration might pose, we identify the province of birth of parents and restrict our sample to those who have not migrated since their birth. Given that households may move within a province, we further restrict our sample to those who are registered in the same district as their place of birth. In robustness checks, we also examine the sensitivity of our results to the inclusion of migrants and find that the results are similar, suggesting that endogenous sorting is not a source of bias in our case. Households with specific characteristics may want to live closer to, or further away from, the border between the former South and North for various reasons. Thus, household or individual characteristics may influence distance to the 17th parallel north latitude, and these may influence economic conditions as well as child labour. We rule this out by conducting checks that examine the impact of distance to the 17th parallel north latitude on household characteristics.

Correlations across neighbouring districts is a further potential source of bias. Neighbouring districts are located a similar distance to the 17th parallel north latitude and are likely to have similar economic conditions that might affect child labour. To ensure that potential correlation across neighbouring districts is not a source of bias, in robustness checks, we employ Conley (1999) spatial regressions that take into account these correlations.

5. Results
5.1. Main estimates

Table 1 presents estimates for the relationship between bombing intensity and child labour for the last 12 months. Column 1 presents results from a linear probability model (OLS). From Column 1, the coefficient on bombing intensity is positive, but statistically insignificant, suggesting that endogeneity is resulting in downward bias in the estimates.

Column 2 presents 2SLS estimates. In the first stage results we find that districts near the 17th parallel north latitude are negatively associated with bombing intensity, consistent with results in Miguel and Roland (2011) and Singhal (2019). The Kleibergen-Paap F-statistic is 22.55, which suggests that our instrument is not weak based on the Stock and Yogo (2005) threshold.

In the second stage results, the coefficient on bombing intensity is positive and significant. Specifically, we find that a 10% increase in the intensity of bombings generates a 1.9 percentage point increase in the probability that a child worked in the last 12 months. Given that the F-statistic for the first stage is not particularly high, in column (2) we report the Anderson-Rubin test, which provides evidence on the validity of the coefficient of an endogenous variable even in the presence of a weak instrument (Finlay & Magnusson, 2009). It shows that at the
95% confidence interval, the impact of bombings on child labour is positive and statistically significant even if the instrument is weak.

Results in Table 1 do not capture the specific economic activity in which children engage. In Table 2, we examine heterogeneity across different types of work in which children were engaged; namely, work outside the child’s household, agricultural work and household non-farm business. The results suggest that the effects of bombing intensity are significant for agricultural work, while the coefficient on bombing intensity is insignificant in the case of work for outside households and non-farm household business. Thus, child work in agriculture appears to be driving the results. As discussed in the earlier section, these results likely reflect that the damage inflicted by the war was greatest in agriculture. Large-scale defoliation resulting from the war hindered agricultural productivity and contributed to poverty in agriculture that is likely associated with higher child labour in agriculture.
5.2. Robustness checks and extensions

In this section, we examine threats to identification and perform additional checks. In Table 3 we present the reduced form estimates. We control for distance to the nearest megalopolis as in Table 1. The results show that distance from the 17th parallel negatively affects the likelihood of child labour. Thus, child labour is lower in districts further away from the border in which bombing intensity was lower, consistent with the 2SLS estimates in Table 1.

In Table 4 we examine if endogenous sorting is a threat to identification. To do so, we regress household characteristics on the instrument to check whether there is any endogenous sorting of households by their distance to the 17th parallel north latitude. We find no evidence of systematic sorting which might bias our estimates. Of the nine regressions, we find that the instrument is not statistically significant in any of the specifications.

Our main results in Table 1 exclude migrants from the analysis in order to address any potential bias that migration might pose. In so doing, we lose about 3 per cent of sample. That we lose such a small proportion of the sample is consistent with the observation in Palmer et al. (2019, p. 866) that ‘the vast majority of households remained or returned shortly after bombing’. In Column 2 of Table 4, we find that distance to the 17th parallel north latitude did not influence migration decisions. In Column 1 of Table 5, we examine the robustness of our results to including migrants in the sample. We find that our results remain robust, but the coefficient on child labour is slightly lower - a 10% increase in the intensity of bombings generates a 1.4 percentage point increase in the probability that a child worked in the last 12 months.

We conduct Conley (1999) spatial regressions to examine if correlations across neighbouring districts are biasing our estimates. The results, reported in Column 2 of Table 5, show that our

### Table 3. Reduced form results

|                  | Child labour in the last 12 months |
|------------------|-----------------------------------|
| Latitude-17N     | −0.027*** (0.008)                 |
| Other controls   | Yes                               |
| Province FE      | Yes                               |
| Cohorts FE       | Yes                               |
| Observations     | 1,778                             |

Notes: Robust standard errors in parentheses are clustered at the district level. Controls are gender, ethnicity, parental age, urban, south, pre-war population (province), district level average rainfall and temperatures during the war, latitude, proportion of district land in different altitude and soil categories, and distance to the nearest megalopolis. ***p < 0.01, **p < 0.05, *p < 0.1.

### Table 4. Test for endogenous sorting

|                  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Male             | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Migrant          | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Father education | 0.008 (0.086) | 0.049 (0.040) | −0.072 (0.640) | −0.838 (0.719) | −0.097 (0.169) | −0.058 (0.094) | −0.253 (0.242) | 0.043 (0.047) | 0.203 (0.134) |
| Mother education | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Parental illness | 1,778 | 1,878 | 1,778 | 1,778 | 1,778 | 1,776 | 1,768 | 1,778 | 1,778 |

Notes: Robust standard errors in parentheses are clustered at the district level. ***p < 0.01, **p < 0.05, *p < 0.1.
results are robust and that the coefficient on child labour is similar in magnitude to Table 1. In the Conley (1999) regressions, a 10% increase in the intensity of bombings generates a 1.7 percentage point increase in the probability that a child worked in the last 12 months.

Quang Tri province was the most heavily bombed province during the Vietnam war. As Miguel and Roland (2011, p. 2) put it: ‘Quang Tri province was basically bombed flat during the war, with most of its capital and infrastructure destroyed’. The effect of the war is likely to be more persistent in this province than other provinces. One might be worried that our results are being driven by Quang Tri province. We examine the robustness of our results to excluding Quang Tri province. The results reported in Column 3 of Table 5, show that our results are robust and that the magnitude of the point estimate on child labour is similar to Table 1. Specifically, in Column 3 of Table 5 we find that a 10% increase in the intensity of bombings generates a 2.1 percentage point increase in the probability that a child worked in the last 12 months.

Another potential concern could be that differences in province-specific resources and post-war policies are potentially driving our results. To account for this, in Column 4 of Table 5 we include a variable that interacts province dummies with linear year of birth time trends. It shows that our results are not driven by differential time trends. In Column 4, a 10% increase

Table 5. Bombings and child labour (Robustness checks)

|                | Including migrants (1) | Conley regressions (2) | Excluding Quang Tri (3) | Linear time trends (4) |
|----------------|------------------------|------------------------|-------------------------|------------------------|
| Log total bombing per km² | 0.138***               | 0.172***               | 0.214***               | 0.181***               |
|                | (0.033)                | (0.034)                | (0.053)                | (0.054)                |
| Other controls | Yes                    | Yes                    | Yes                    | Yes                    |
| Province FE    | Yes                    | Yes                    | Yes                    | Yes                    |
| Cohorts FE     | Yes                    | Yes                    | Yes                    | Yes                    |
| Observations   | 1,878                  | 1,778                  | 1,772                  | 1,778                  |

Notes: Robust standard errors in parentheses; 2SLS regressions; Controls are gender, ethnicity, parental age, urban, south, pre-war population (province), district level average rainfall and temperatures during the war, latitude, proportion of district land in different altitude and soil categories, and distance to the nearest megalopolis; first stage results pass the relevant tests; ***p < 0.01, **p < 0.05, *p < 0.1.

Table 6. Bombings and child labour – Young Lives survey

| Child labour                          | Any activities (1) | Farm households (2) | Outside households (3) | Household chores (4) |
|---------------------------------------|--------------------|---------------------|------------------------|----------------------|
| **Panel A: Intensive margin (dependent variable is hours worked in last 14 days)** |                    |                     |                        |                      |
| Log total bombing per km²             | 0.072              | 0.055**             | 0.023                  | −0.005               |
|                                       | (0.061)            | (0.026)             | (0.029)                | (0.026)              |
| **Panel B: Extensive margin (dependent variable is work status in the last 14 days)** |                    |                     |                        |                      |
| Log total bombing per km²             | 0.012              | 0.022***            | 0.029                  | −0.021               |
|                                       | (0.016)            | (0.007)             | (0.028)                | (0.018)              |
| Other controls                        | Yes                | Yes                 | Yes                    | Yes                  |
| Province FE                           | Yes                | Yes                 | Yes                    | Yes                  |
| Time FE                               | Yes                | Yes                 | Yes                    | Yes                  |
| Observations                          | 1,817              | 1,806               | 1,807                  | 1,807                |

Notes: Robust standard errors in parentheses; 2SLS regressions; standard errors are clustered at commune level; controls include gender, age, minorities, school attendance, household size, parental age, parental education, rural areas; first stage results pass the relevant tests; ***p < 0.01, **p < 0.05, *p < 0.1.
in the intensity of bombings generates a 1.8 percentage point increase in the probability that a child worked in the last 12 months, which is very similar to Table 1.

Our main results are based on the 1997/1998 VLSS because it is the most appropriate survey timewise for reflecting the period when most second-generation children were potentially engaged in child labour. We examine the robustness of our main results to the use of the Vietnamese module of the 2002 to 2013 Young Lives Survey. The Young Lives Survey has the main advantage of allowing us to examine the effect of bombing at the intensive and extensive margins. Given that district identifiers are not reported in the Young Lives Survey, we use measures of bombing intensity at the province level in the case of this dataset. In Table 6, using the Young Lives Survey data, at the intensive and extensive margins we find that our results are robust only to child labour in agricultural (or farm) work. Specifically, at the extensive margin, a 10% increase in the intensity of bombings generates a 0.22 percentage point increase in the probability that a child worked in the last 14 days while at the intensive margin, a unit increase in the intensity of bombings generates a 0.022 unit increase in the number of hours a child is engaged in farm work. The magnitude of the effect at the external margin is similar to that in Column 2 of Table 2. Overall, this result is consistent with the heterogeneity analysis in Table 2 that child labour in agricultural work is driving the results.

5.3. Mechanisms

Section Conceptual relationship between war and second-generation child labour discussed the potential role of economic growth, poverty, parental health and parental education as mechanisms through which war might influence second generation child labour. In this section, we examine whether the relationship between bombing intensity and child labour is channelled through household poverty, parental health, parental education and economic activity. For each of these variables to be potential channels, in addition to being correlated with bombing intensity, they should also be correlated with child labour and the inclusion of each of this variable as an additional covariate in the regression linking bombing intensity to child labour should decrease the magnitude of the coefficient on bombing (i.e. partial mediation) or render it statistically insignificant (i.e. full mediation).

As a first step, in Table 7, we examine the impact of bombings on the mediators. While we find no significant effect of bombing intensity on economic activity, parental education and illness, we find that an increase in bombing intensity is associated with higher prevalence of household poverty (MPI). The result that exposure to war does not have an impact on economic activity at the district level, as measured by night time light, is consistent with Miguel

| Night-time light intensity | Father highest education | Mother highest education | Parental illness |
|---------------------------|-------------------------|-------------------------|-----------------|
| Log total bombing per km² | 1.704                   | -0.013                  | 0.022           |
|                           | (1.063)                 | (0.045)                 | (0.042)         |

Notes: Robust standard errors in parentheses; OLS regressions with standard errors clustered at the district level; controls include gender, ethnicity, parental age, urban, south, pre-war population (province), district level average rainfall and temperatures during the war, latitude, proportion of district land in different altitude and soil categories, and distance to the nearest megalopolis; **p < 0.01, *p < 0.05, *p < 0.1.
and Roland (2011) and Palmer et al. (2019) who find that bombing had no impact on poverty rates at the district level. One possible explanation for why our results for the effect of bombing on poverty rates differ from Miguel and Roland (2011) lies in the differences between aggregate and household level outcomes. Ravallion (2001) shows that there is considerable variance in outcomes for the poor, such that economic growth measured in the aggregate does not always translate to higher living standards for the poor measured at the household level. Economic growth or poverty reduction at the district level reflect average effects. But, as Ravallion (2001, p. 1812) emphasises: ‘An average is just that … . The churning that is found under the surface of the aggregate outcomes also means that there are often losers during spells of growth, even when poverty decreases on average’. The finding that bombing increases the prevalence of household poverty using one indicator, but has no effect on aggregate poverty rates using different indicators as demonstrated in our study using night time light data and that of Miguel and Roland (2011), is, thus, consistent with the development literature in terms of both the conceptualization of welfare indicators and the mechanisms through which aggregate improvements in development indicators translate into household welfare improvements. Thus, even though economic growth may be rapid given post-war reconstruction investment (Miguel & Roland, 2011), this does not necessarily translate into beneficial development outcomes for individuals or households in the long-term (Adams, 2004; Ravallion, 2001).

Table 8 reports results that include household poverty (MPI) as an independent variable in which child labour in the last 12 months is the dependent variable. Higher poverty is associated with a higher probability of child labour in the last 12 months. With the inclusion of MPI as an additional covariate, there is a significant decrease in the coefficient on bombing intensity. Specifically, the effect of bombing in the baseline model is 0.186 (repeated in Column 1 of Table 8 for comparison), however, with the inclusion of MPI as a covariate, this drops to 0.165. Thus, the observed direct effect of bombing on child labour is 0.165 while the indirect effect channelled through MPI is 0.021, which represents a 12.7% of the direct effect. These results suggest that household poverty is a mechanism through which war influences child labour.

### 6. Conclusion

An increasing number of studies have examined the impacts of civil conflicts on development outcomes (Verwimp, Justino, & Brück, 2019). This area of research is motivated by the fact that the poorest and most vulnerable households are often located in regions with armed conflicts. This literature, which examines a wide range of economic outcomes, has largely focused...
on the long-run impacts of war on the generation who lived through the conflict or war. Relatively speaking, much less is known about the intergenerational impact of war.

We contribute to the literature on the intergenerational impacts of war by examining the long-lasting impacts of the Vietnam War on the prevalence of child labour. Given that child labour is associated with negative long-term outcomes, it is important to get a fuller understanding of the causes of child labour in order to design policies that can reduce child labour, especially in vulnerable households, such as those who have been victims of war. Using data from the 1997/1998 VLSS, merged with bombing intensity data drawn from Miguel and Roland (2011), our results suggest that the Vietnam War is associated with a higher prevalence of child labour among the second generation. Both the heterogeneity results with the main dataset and the robustness checks, using an alternative dataset on child labour and household characteristics, suggest that it is likely that child labour in agricultural work is driving this result. These results are important given that globally the agricultural sector accounts for 71 per cent of all those in child labour and for 108 million children in absolute terms (ILO, 2017). We find that the effect of bombing intensity on child labour is channelled through household poverty. From a policy perspective, our results suggest that while post-war investment may be sufficient to ameliorate the effect of the war on poverty in the aggregate, targeted interventions to address household poverty may be required to mitigate the long-term effects for individuals and their children.

Notes
1. We apply the International Labour Office’s (ILO) definition of child labour (ILO, 2015), which ‘refers to exploitation of children through any form of work that deprives children of their childhood, interferes with their ability to attend regular school, and is mentally, physically, socially or morally harmful.’ According to the ILO’s minimum age convention, ‘child labour refers to any work performed by children under the age of 12, non-light work done by children aged 12–14 and hazardous work done by children aged 15–17.’ We restrict our attention to the age group of 6–15 because the VLSS do not collect data on the allocation of time for household members below the age of 6, while employing 15 as the upper age limit is consistent with the existing literature (Edmonds & Pavcnik, 2002; O’Donnell, Rosati, & Van Doorslaer, 2005).
2. Note that Singhal (2019) restricts his sample to respondents born between 1960 and 1975. This is because he is specifically interested in the effect of the war on individuals who were aged five or less during the war. We use a slightly longer timeframe because we are also interested in capturing the effect of war on parents who were older than five during the war who, for example, had their education disrupted.
3. We do not have information on school attendance for children and, thus, we are not able to examine the trade-offs between child work and schooling in this study. We find that our results are robust to an alternative measure of child labour that captures economic activities in the last seven days before the interview date.
4. The indicators used under each dimension are reported in Supplementary material Table A2.
5. The VLSS presents data for 172 districts across Vietnam. Accounting for missing observations, we matched bombing data with VLSS data for 159 districts.
6. Note that we restrict our sample to parents who have not moved and the children live with their parents. Children were not asked about migration, but given that they live with their parents and the surveys of children and parents are linked, we assume that children in the sample have not migrated either. This seems a reasonable assumption given that all of the children in our sample are aged between six and 15.
7. Table A3 in the Supplementary material provides the full set of results with relevant covariates.
8. We find that our results are robust to the use of the probit estimator.
9. The results when the dependent variable is child labour in the last 7 days are similar.
10. While the first stage F-statistic is higher than the Stock and Yogo (2005) threshold of 10, in interpreting whether the instrument is weak, a complicating factor is that we cluster the standard errors at the district level. As noted by Angrist and Pischke (2009) and Singhal (2019), with clustered standard errors, the relationship between the F-statistic and the weakness of the instrument is not clear.
11. For studies in the economics literature that employ this approach to mediation see, for example, Alesina and Zhuravskaya (2011) and Awaworyi Churchill et al. (2019).
12. The results for parental health in Table 7 could potentially be because we do not specifically focus on disability resulting from the war or permanent health issues arising from the war (the VLSS does not contain data on parental disability). As a check on the results (not reported), we use the 2006 VHLS data in which we treat parental disability as a mediator. We find that parental disability is not a mediator with that dataset. It should
be noted, though, that the VHLSS asks respondents if they have a disability. It does not measure disability or permanent health effects linked directly to the war. Palmer et al. (2019) show that the Vietnam War had long-lasting effects on disability of those exposed to the conflict using the 15% sample of the Vietnam Population and Housing Census (VPHC), which has a detailed measure of disability. The VPHC, however, unfortunately does not contain information on child labour.

Disclosure statement

The authors declare that they have no conflict of interest.

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