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# Commodity Prices and Violence in Indonesia

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**Abstract:** What is the linkage between commodity prices and violence? Earlier theory proposes two potential dimensions of the relation. First, through heightening the opportunity cost of crime and conflict, spikes in wages lower violence – the *opportunity cost effect*. Second, by means of enlarging the incentives of appropriation, rises in contestable income increase violence – the *rapacity effect*. Implied, then, is that changes in prices for labour intensive goods (which correlate strongly with wages relative to rents and asset value) relate negatively with violence, and that changes in prices for capital intensive goods (for which the opposite hold) relate positively with violence. However, recent research suggests it could be more complicated. For if the contestable income becomes greater, so should the state's capacity to defend and deter appropriation. This is the *state capacity effect*. Through exploiting the world's largest national data set on violence and examining how changing prices in commodities hit local regions with varying levels of production differently, we test these economic processes empirically in a case study on Indonesia. Through our tests, we provide evidence for the two lastly mentioned, counteracting effects, and find no clear support for the first. For the capital intensive commodities, the rapacity effect seems to dominate the state capacity effect. For the labour intensive, the results are ambiguous and indicate that, in this context, the fundamental dichotomy of labour and capital intensity itself is problematic.

**Keywords:** Violence, Commodity Prices, Labour Intensity, Capital Intensity

**JEL:** D74, O13, Q02, Q34

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# 1 Introduction and Purpose

That economics plays a key role in understanding crime, conflict, and violence is well established. In conflict economics, violence is seen as a rational economic choice much like any other. Occasionally, this is illustrated and examined through the lens of game theory, where different payoffs lead rational agents to pursue either violent or peaceful actions to gain income. In order to understand what agents' different economic options look like, it is essential to specify the opportunity cost of entering criminality versus entering the labour force. Here, empirical research becomes necessary. While the general link between income levels and civil unrest – that poverty lowers the opportunity cost of crime and insurrection – is widely accepted, there are related underlying questions that remain without definite answers.

Particularly, it is relevant to specify what forms of income-altering events or trends that lead to this shift in opportunity cost. Most straight-forward is to simply look at how wages have fluctuated over time. Still, the relationship can of course be studied more thoroughly in order to see if it holds for other ways of measuring prosperity levels. For example, research on the role of food prices in the Arabic spring (Lagi, Bertrand, and Bar-Yam, 2011) and in conflict in general (Brinkman and Hendrix, 2011) has identified a positive correlation between global food prices and civil unrest.

What about other types of goods? Can commodity prices be found to explain varying levels of violence more broadly? As outlined in Section 2, previous research is limited and conflicting.

A country-specific case study on Colombia (Dube and Vargas, 2013) finds empirical support for a negative relationship to violence for changes in prices of labour intensive goods, and a positive relationship for the same of capital intensive goods. This, they conclude, is caused by two opposing effects. First, price falls in labour intensive commodities lower wages and decrease the opportunity cost of criminal activities disproportionately in communities that produce these commodities. Second, price hikes in capital intensive commodities lead to increased municipal revenue and greater incentives to pursue appropriate activities due to higher valued resources to fight over.

A subsequent cross-country study (Bazzi and Blattman, 2014), however, finds no support for the relations just described, and furthermore proposes a third effect: that increased prices of capital intensive commodities lead to states retaining higher rents and tax revenues, which in turn translates to a more powerful military and police apparatus and a greater capacity to defend against illegal appropriation.

How sweepingly, then, can these conclusions be drawn? Is it possible to find empirical backing for these effects in more countries than just Colombia such that they can be said to hold more generally?

This paper sets out to examine just that. Through building on the findings of previous empirical research and exploiting intricate regional conflict data, we analyse commodity prices and violence in Indonesia, the world's fourth most populous nation, between 1997 and 2014. It is a country with, for its level of economic development, advanced statistical facilities, and the Indonesian dataset on violence that this paper uses, the National Violence Monitoring System Dataset (discussed in more detail in Section 5.1), is the largest national dataset on violence in the world (Barron, Jaffrey, and Varshney, 2014). Geographically, Indonesia is the antipode to Colombia, and with the world's largest Muslim population, it differs substantially religiously and culturally from Latin America, making for a suitable and relevant case to study to answer the questions above. The time period examined is also appropriate, as it encompasses significantly different levels and types of violence. On the one hand; the extraordinarily turbulent and violently multifaceted years around the turn of the millennium following the Asian financial crisis and the fall of president Suharto, and, on the other; the peaceful and stable years of relatively successful democratisation thereafter.

# 2 Related Literature

## 2.1 Model Background

The theory used in this paper builds on several previous frameworks. Most fundamental is the influential crime modulations by Becker (1968) and Ehrlich (1973), in which criminal activity is considered a rational choice when the risk adjusted expected return to crime exceeds wages. As this expected return increases (decreases) relative to wages, more people enter (reject) the criminal sector and crime rises (falls). As Dube and Vargas notes, and as is shown by Grossman (1991), Grossman (1999), and Hirshleifer (1995), this framework is also applicable for insurgencies and conflict-related appropriation, rather than being limited to general crime.

Dal Bó and Dal Bó (2011) build further on this by developing a model on the relation between international price fluctuations and conflict and crime intensity, with the main mechanism in the model being that prices move the costs and benefits of appropriation through relative wages and wealth. In their work, they view social conflict as "appropriative activities" through two canonical models of international trade in an open economy: the Hecksher-Ohlin and the Ricardo Viner. The basic foundation of the model is the 2x2 international trade model with one labour intensive sector and one capital intensive, but in this case they instead consider an economy with three different sectors: two productive sectors that each uses one of two factors (labour and capital) and one unproductive sector which appropriates resources and wealth from the productive ones. Firms maximise profits and technologies have a constant return to scale. Workers decide whether they enter the unproductive sector or the productive ones, and the return to a worker in the appropriation sector per unit of labour is an equal share of the total appropriated wealth.

In the context of changing commodity prices, two opposing forces come to play. First, an increase in price may lead to greater returns to labour, i.e. higher wages, and thus an expansion of the lawful labour sector – the *opportunity cost effect*. Second, an increase in price could raise rents and the value of the appropriable wealth, thereby increasing the incentives to seize said wealth – the *rapacity effect*. Which of these two conflicting effects that is dominant, and whether violence increases or falls, depends on the relative intensity of the two. This in turn implies that violence will have a negative relationship with price changes in labour intensive goods, for which a relatively large portion of returns flows into wages, and a positive relationship with price changes in capital intensive goods, for which a relatively large portion of returns falls to rents and asset value.

The level of social conflict and the degree of violation of property rights is then determined by the equilibrium size of the appropriation sector; if the expected returns to appropriation increase more than wages, the appropriation sector should expand, and, conversely, if wages increase more than contestable wealth, it should contract.

## 2.2 Empirical Application

### 2.2.1 Colombia by Dube and Vargas

Dube and Vargas (2013) use the theoretical framework that Dal Bó and Dal Bó develop in an empirical setting, namely, Colombia between the years 1988-2005. The main two commodities studied are coffee, which is assumed to be labour intensive, and oil, which is assumed to be capital intensive, and the four parameters chosen to measure violence are guerilla attacks, paramilitary attacks, clashes, and casualties. Colombia is one of the largest coffee producers in the world, and the crop is cultivated throughout the country. Oil production is not as widespread but is nevertheless undertaken in a number of municipalities. If the Dal Bó and Dal Bó framework is true, spikes in price for the international oil market should increase violence in the oil producing municipalities differentially more than in non-producing municipalities, and negative changes in the international price for coffee should increase violence differentially in municipalities with intensive coffee production. Due to the Colombian setting, the authors also take other driving factors of violence into account, mainly the narcotraffic sector and the production of cocaine.

Dube and Vargas express that they find support for the abovementioned relation between commodity prices and civil conflict. According to their findings, the sharp drop in coffee prices during the 1990s increased civil unrest and violence in the municipalities with higher coffee production intensity. Between 1997-2003 the coffee price fell by 63 percent while guerrilla attacks increased by 18 percent, paramilitary attacks by 31 percent, clashes by 22 percent and casualties (although not significant at a 5 percent level) by 14 percent. They also find that wages and hours worked decreased during the time period, i.e. that the price decrease in coffee affected violence through the opportunity cost effect.

For the oil producing municipalities, the surging oil prices between 1998 and 2005 further increased the number of paramilitary attacks. The 137 percent price hike during the period resulted in a 14 percent increase in paramilitary attacks. For the other three violence parameters used, no significance is found. When testing the channel relevant to oil (the rapacity effect) directly, regressions on two out of three parameters render significant coefficients with the anticipated signs. They furthermore test the relationship between violence and price changes in coal and gold, with similar results to that of oil. While not obtaining significance and the expected signs across all parameters of violence or channels, their results are generally consistent with the Dal Bó and Dal Bó framework and previous modulations by Becker and Ehrlich.

### 2.2.2 Sudan by Chen et al.

Chen, Kibriya, Bessler, and Price (2018) study the linkage between food prices and conflict in Sudan with a particular focus on determining the causality. The three commodities studied are wheat, millet, and sorghum. Through structural vector autoregression, they find that heightened food prices in general, and heightened wheat prices in particular, lead to increased levels of violence. Furthermore, they conclude that no reverse causality is evident. Since they only study cereal commodities principally consumed domestically within Sudan rather than exported, and because the commodities are substitutes for each other, price fluctuations of one good are found to influence those of other. In the article they deduce that price fluctuations in general are positively tied to conflict outbreaks. They furthermore provide policy recommendations as to how to limit the effects that price fluctuations have on violence.

To consider the differences between the methodology of Chen et al. (2018) and the ones used in the other two empirical studies outlined here helps segment and narrow the focus of our study (see further discussion in Section 6.1).

### 2.2.3 Cross-Country Study by Bazzi and Blattman

Bazzi and Blattman (2014) take the issue to a cross-country level, creating a price shock index consisting of a wide array of commodities across the latter half of the 20th century, in all developing nations with populations larger than 1 million. On aggregate, they find no support for a relationship between price shocks and new conflicts, going against the findings of Dube and Vargas' Colombia case study. However, they do conclude that rising prices lead to shorter and less deadly wars, i.e. that price shocks have an effect on already existing conflicts.

When looking at capital intensive goods specifically, Bazzi and Blattman also obtain results opposite to those of Dube and Vargas: a negative relationship between prices of capital intensive goods, and levels of conflict. They concede that rising prices in these goods in itself should indeed make insurrection more attractive, as it increases the value of the assets that can be seized in the appropriation sector. Still, they say, this effect is offset by a larger one, namely, the *state capacity* – the state's ability to fight off insurgents – which also should become greater as state revenues increase. Due to this state capacity effect, Bazzi and Blattman's results conflict with the rapacity effect supported by the findings of Dube and Vargas. Nevertheless, Bazzi and Blattman acknowledge the depth and insights offered by country-specific research and explicitly call on theorists to undertake more quantitative case studies like the one on Colombia.

An important, and in this context previously not considered, distinction they make is that between annual crops, which need to be resown or replanted after harvest, and perennial crops, which produce output during a number of years:

> "[...] not all commodities are so easily captured or bring equal rents to the state. Any

> traded commodity is taxable, but some are more easily taxed than others, especially immobile, concentrated commodities with large fixed costs of investment or high switching costs. This includes nonalluvial, capital-intensive mining and petroleum, or 'extractive' commodities. It also likely includes lumber, rubber, and perennial tree crops like coffee and cocoa." (Bazzi and Blattman, 2014)

The difference in categorisation of different commodities – whether, for example, these perennial crops are assumed to be labour intensive as in Dube and Vargas's research, or capital intensive as in Bazzi and Blattman's – has significant influence on the subsequent analyses. So also for this paper, as all tested agricultural commodities are perennial. This is further discussed in Section 3.4.

# 3 The Indonesian Setting

## 3.1 Sub-National Focus

After having outlined the general Indonesian setting in the sections below, we will subsequently zoom in on the second sub-national administrative level of Indonesia, which comprises more than 500 regencies and cities. These two regional unit types are the same in terms of governance and autonomy, and differ specifically in demographics and size. Throughout this paper, these are collectively referred to as "districts" or "the district level". These districts together form 34 provinces, the first sub-national level in Indonesia.

## 3.2 Conflict Background

### 3.2.1 Origins

Since its independence in 1945, Indonesia has seen various types of violence and conflicts within its borders. When the Netherlands officially submitted power in 1949, various struggles emerged as different groups sought to take control from the new secular and nationalistic government led by Sukarno, independent Indonesia's first president who would govern for two decades. Initially, the most violent challenge came in the form of Maridjan Kartosuwirjo's Darul Islam movement, whose ambition was to establish an Islamic state. The Islamic revolt spread to many parts of the country and lasted until Kartosuwiryo was captured and executed in 1962, but the idea of an Indonesia instituted on Islamic principles still remains a factor today, as Islamic extremism and terrorism continue to be a threat (not least in the province Aceh, as covered in the next section).

Another source of conflict was the left's attempt to form an Indonesian Soviet Republic through the communist party PKI. After having been suppressed in the late 40s, PKI managed to become a major political force and an ally to Sukarno's government in the 1950s. Lastly, there were secular, anti-communist, and authoritarian groups within the military with significant clout. Sukarno managed to stay in power through a long period of political instability by balancing these opposing forces of the left, political Islam, and the military while steering Indonesia from a typical Western-style democracy to a more authoritarian "Guided Democracy". Eventually, however, the instability got out of Sukarno's hands. In September 1965, after having prevented a coup from within the military, General Suharto took control of the army. Suharto made PKI the public enemy number one and subsequently ordered mass killings of PKI members and affiliates, resulting in 500,000 deaths within a year. Suharto became president a year later and replaced Sukarno's Guided Democracy with his own totalitarian "New Order". Through it, political competition was nullified. Although democratic freedoms were limited and gross human rights violations were made, Suharto managed to stabilise the country from major domestic conflicts. This stimulated foreign investments and kept growth rates high for several decades. However, Indonesia was severely affected by the 1997 Asian financial crisis, contributing to Suharto's downfall in May 1998 (The Asia Foundation, 2016).

### 3.2.2 Conflict and Violence during the Studied Period

Separatist movements have played a part of the Indonesian political landscape ever since the nation declared its independence. Still, Sukarno and Suharto managed to control these through military action, special autonomy arrangements, political patronage, and economic development. The collapse of Suharto and his New Order in 1998 marked the beginning of a new period, both of fights for regional independence and for resource-related violence, with student protests turning into riots, leading to 1,200 deaths within three days following Suharto's resignation. In the years 1998-2004, Indonesia saw its highest level of violence since the 1965 communist killings, and regional conflicts erupted in many of the country's provinces, from Aceh in the northwest through the centrally located islands of Kalimantan, Sulawesi, and Maluku, to the eastmost part of the country, Papua. In Aceh and Papau, the conflicts were driven directly by quests for independence. Similarly, but in a less intensive manner, violence during these years revolved chiefly around communal disputes of identity and land also in most other parts of the country, with different ethnic and religious groups fighting each other. The conflicts often started as small-scale community-based clashes which then subsequently escalated into organised, larger armed confrontations. Thanks to a recovering economy, democratic reforms, and arguably also to the decentralisation process (covered in the next section), this violent period came to an end around 2005. Since then, Indonesia has seen much lower levels of violence overall, and less deadly violence in particular. As the country has become more stable, non-conflict related crime now makes up the clear majority of violence. From 2005 to 2014, less than 100 of the total 2,500 violent deaths were linked to elections or political competition, and these were to large extent concentrated to remote areas and regions previously affected by large-scale conflict, e.g. Papau and Aceh (Schulze, 2016; The Diplomat, 2019). However, certain types of violence are instead on the rise.

First, as stated in the previous section, Islamic fundamentalist forces did not vanish with Kartosurwirjo's death in 1962. In fact, some parts of the country are as influenced by sharia-esque ideas now as ever. In Aceh, theological fundamentalism is institutionalised through the regional Islamic criminal laws that, partly as a consequence of the increased local autonomy, override some of Indonesia's secular national laws (Amnesty International, 2016; The Guardian, 2018).

Second, while today only making up a couple percent of violence in Indonesia, conflicts over resources and community rights are comparatively deadlier than other forms of violence. Moreover, the phenomenon is increasing: between 2010 and 2014, incidents went up by 40 percent. Most of these were related to land disputes, often with local civil groups fighting industrial companies. Other resulted from opposing ethnic groups or clashes between indigenous groups and migrants (The Asia Foundation, 2016). Generally, today's land conflicts in the country stem from policies put in place either during the colonial era or during Suharto's New Order regime. One such policy was the 1967 Forestry Law through which the state gained control of 70 percent of Indonesia's land. As a direct consequence, aspects like sustainability, environmental issues, and communal rights where disregarded for the sake of plantations and agricultural concessions. Since then, major bureaucracy problems between national and local governmental powers and many layers of conflicting laws (the decentralisation process discussed in the next section has, for example, led to a situation where more than 1,000 distinct interested parties possess law-making powers over forest resources) furthermore make ownership rights and land classification less clear (The Asia Foundation, 2016; Forest Legality Initiative, 2016).

## 3.3 Economic Development post Suharto

### 3.3.1 Decentralisation

With the fall of Suharto in 1998, a new political and economic era began. The main theme since then has been democratisation and decentralisation, with financial and political authority being continuously transferred from Jakarta to local governments. The powers shifted cover a wide array of public goods and economic sectors, e.g. education, health care, communication, agriculture, manufacturing, mining, and oil and gas.

Nevertheless, as highlighted in an editorial of The Jakarta Post, corruption has not been eliminated:

> "Statistics reveal an ugly fact about the country's much-vaunted decentralisation that began nearly 20 years ago. As the number of autonomous regions has climbed to 546, Home Ministry records show 343 regents/mayors and 18 governors have been investigated for corruption within that period. Unsurprisingly, many quip that regional autonomy, one of the hallmarks of reformasi, has only 'decentralised' corruption on account of the transfer of authorities from Jakarta to local governments." (The Jakarta Post, 2017)

A report from the International Crisis Group further questions the degree to which the reform have had stabilising effects:

> "Local institutions in Indonesia, empowered by decentralisation, are defying the country's highest courts with impunity, undermining judicial authority and allowing local conflicts

to fester. District councils, mayors and regional election commissions have learned that there is little cost to ignoring court rulings on electoral or religious disputes, pandering instead to local constituencies and pressure groups." (International Crisis Group, 2012)

Still, researchers underscore the expanded democratic freedoms and relative peace that has been established since the initial violent years after Suharto. After having first been seemingly counter-productive and having halted regional development as communal conflicts ensued over new regional boundaries, the decentralisation process has subsequently led to decreasing tension around ethnic lines; Indonesia's districts have been greatly increased in number and reduced in size and population, resulting in less ethnic fractualisation among Indonesia's highly ethno-culturally diverse population (Nasution, 2016 and Talitha, Firman, and Hudalah, 2019). Overall, it seems likely that no clear cut political consensus or verdict on the reform will crystallise in the near future.

### 3.3.2 Consequences for Revenue Sharing

The system of revenue sharing in Indonesia differs depending on the type of natural resource. Four different systems are in place: one covering mining, forestry, and geothermal; one for oil; one for gas; and one for fisheries. The mining system is particularly derivation-based, with 64 percent of the collected revenues being distributed on the district level after national and provincial governments have retained 20 and 16 percent respectively. In the oil and gas sharing systems, in contrast, the national government keeps much a larger share: 85 percent and 70 percent respectively, with provinces receiving 3 and 6 percent and districts 12 and 24 percent (Agustina, Ahmad, Nugroho, and Siagian, 2012).

The decentralisation reform has, through the revenue sharing systems, led to districts receiving and retaining substantially more income than before. During the last two decades, therefore, Indonesia has, in line with the institutional development covered in the previous section, continuously become more fiscally decentralised. The regional revenue collected by the local governments increased from a district average of IDR 15,000 billion in 2001 to IDR 83,000 billion in 2010 and further to IDR 229,000 billion in 2016. With this greater fiscal independence, provinces and districts have gained a larger authority to allocate expenditures as to cater local public interests (Nursini and Tawakkal, 2019). This theme of decentralisation in Indonesia is important for the questions this paper examines; it has significance for both the rapacity channel and the state capacity channel proposed by earlier theory. For as the locally retained income has reached unprecedented levels, the incentives to seize and fight over these local assets should also be elevated. But, on the other hand, as should the local districts' ability to fend off and deter insurgence.

## 3.4 Palm Oil Production

Today, Indonesia is the world's largest producer and exporter of palm oil by far, with 42.5 million tonnes being produced annually as of 2019, roughly twice the amount of the second largest producer, Malaysia. During the time period studied, 1997-2014, the national compounded annual growth rate in production volume was 11.7 percent. The global development has been mirroring that of Indonesia, with an average annual consumption increase over the past 40 years of 7.8 percent. In terms of area, palm oil plantations cover 13 million hectares, roughly seven percent of Indonesia's total land.

Some of Indonesia's largest publicly listed companies operate in the palm oil industry (e.g. Golden Agri Resources, Royal Golden Eagle, and Salim Ivomas Pratama PT) and many of its wealthiest people have significant stakes in, and owe their fortunes to, the palm oil industry. It is estimated that five of the nation's 40 wealthiest individuals, with a collective net worth of USD 18.3 billion, have significant interests in the palm oil industry (Accenture for Humanity United, 2013).

In palm oil cultivation, there are three main forms of plantation and ownership that exploit different growing methods to maximise productivity and efficiency. These are: 1) private estates, 2) smallholder estates, and 3) government estates.

*Private estates* are plantations operated by a single, and often commercial, owner. The private estate model has been adopted by most commercial growing operations, and most of the land planted with palm oil is operated under this model. To maximise output, private estate plantations are large-scale operations that typically cover thousands of densely and uniformly planted hectares of land.

Growing palm oil under the private estate model typically produces the highest yields and profitability, because large companies can afford to buy agricultural chemicals such as pesticides and fertilizers, tend to have better seedlings and crops to select from, and produce on more fertile land. Commercial growers therefore prefer private estates. However, this model requires large plots of fertile land, an input that is a potential constraint to expanding operations due to cost and limited availability.

*Smallholder estates* are plantations that cultivate less than 50 hectares of land. In Indonesia, these make up a significant portion of the total production and account for 38 percent of cultivated land. This system of plantation is intended to help distribute wealth to lower-income households and is supported by the Indonesian government.

*Government estates* are initiatives operated by the governments of producing countries to encourage the widespread growth of oil palm cultivation, as well as the distribution of wealth to lower-income citizens. Government schemes operate similarly to dependent smallholder schemes, where the associated central estates are government-owned organizations or estates managed collectively by participating smallholders.

Further overviews on several other tested commodities are provided in the appendix.

## 3.5 Discussion of Labour and Capital Intensity

The theory provided by Dal Bó and Dal Bó considers two productive sectors, one labour intensive and one capital intensive, and divides commodities in a binary fashion accordingly. In reality, however, intensity is continuous, not discrete. Thus, the two categories are better understood as two end points on a spectrum, with a theoretical 100 percent capital intensive good on the one end, and a theoretical 100 percent labour intensive good on the other. All goods traditionally deemed to be labour intensive and all those deemed capital intensive can then be placed on the two different halves of this spectrum. To underline the discrepancy between theory and reality is not merely academic nitpicking, but has large implications on the issue at hand: Dube and Vargas who assume that coffee, a perennial crop, is labour intensive, conclude that their findings of negative coffee price fluctuations relating to more violence constitute empirical support for theory. Had they instead viewed this perennial crop to be a sort of hybrid, a third category in between annual crops and extractive commodities, as Bazzi and Blattman do, it is not as clear what conclusions could be drawn, since theory would then be ambiguous as to what the expected results would be.

In terms of real-world examples, mining might in some cases, especially in developing nations, have significant inputs of manual labour, and agricultural crops might in other cases, especially in developed nations, be heavily dependent on capital intensive equipment. Dissecting palm oil production is another good way to illustrate the problem. While the later stages of processing and refinement of palm oil require substantial capital, the initial cultivation and harvest is labour intensive with no major automatisation currently in place across Indonesia. A significant workforce is needed to carry out the tasks of planting new oil palm seedlings, harvesting fresh fruit bunches, servicing already existing trees, and disposing of old trees. The palm oil industry as a whole, that is when the all stages of production are included, is still considered to be labour intensive. Correspondingly, we focus this labour intensive part of palm production, the initial cultivation, by measuring intensity as the number of hectares used for plantation, instead of a volume-based metric, e.g. number of tonnes produced, which would be more dependent on the final, refined and processed product.

# 4 Research Proposition and Questions

From the review of earlier literature and the background of the Indonesian setting and economic development, we conclude that three different areas are of particular interest when studying commodity price fluctuations, namely: violence, ownership structure, and the theorised channel effects.

## 4.1 Commodity Prices and Violence

Can similar relations between price fluctuations and violence, theorised by Dal Bó and Dal Bó and empirically supported by Dube and Vargas, be found in Indonesia, a country in many regards distinct from Colombia?

In contrast to Dube and Vargas's country-specific study, Bazzi and Blattman find no support for the Dal Bó and Dal Bó framework in their cross-country study, and furthermore highlight a third effect not formally considered by Dube and Vargas: the state capacity effect. Moreover, as discussed in the previous section, their segmentation of labour intensive commodities into annual and perennial illuminates the issue of oversimplification induced by the theoretical bisection of commodities into the labour and capital intensive groups. One implication for our paper of constructing this problematisation is that the relation between price changes and labour and capital intensive goods will, in contrast to the case of Dube and Vargas, be analysed on a commodity-aggregate level to allow for potential worse fits for individual commodities caused by the binary division. We posit, as is also implicitly assumed by Bazzi and Blattman in their approach of testing a multitude of commodities and analysing them on an aggregate level, that in order to draw conclusions on individual commodities, a method of more precisely determining to what degree these are labour or capital intensive, rather than simply placing them in one of two or three categories, is required. Notwithstanding, the two-/threefold division of commodities is necessary to make to be able to test the framework, and will thus be reflected throughout this paper.

The labour intensive goods we test are all perennial, and when mentioning the suggested or anticipated results of coefficients of these perennial commodities, it is on the basis of the assumption that they are labour intensive. Further reflections and discussions about this assumption will then be made in the light of the subsequent results. Annual crops are not tested for two reasons. First and foremost, there is no data available on production on district level. Second, annual crops are heavily traded on the domestic markets in Indonesia, meaning that the prices that Indonesian farmers and consumers face are more, if not almost completely, endogenous. This would strain the theoretical framework provided by Dal Bó and Dal Bó since the price fluctuations must be sufficiently exogenous to the economy.

As there is no real consensus on the empirical applicability of the Dal Bó and Dal Bó framework, it is difficult to justify narrowly specified expectations of results. Instead, since the paper's central aim is to test the theoretical framework, the relevant question is whether the results *it* suggests hold. The theoretical framework states that violence increases disproportionately more with negative price changes for labour intensive commodities in areas where production is located. The opposite relation holds for capital intensive commodities, where violence increases with positive price fluctuations in areas with higher intensity of production. Adapted to the discussion of Bazzi and Blattman around perennial crops, the suggested outcome for labour intensive commodities is more ambiguous.

Through the National Violence Monitoring System, five main parameters of violence will be used: deaths, injuries, kidnappings, sexual assaults, and building destruction. The dataset includes both conflict and crime related violence. Arguably, this suits the underlying theory by Becker and Ehrlich better than being limited specifically to violence caused by conflict, seeing as said theory was developed in the context of crime in general rather than of conflict specifically.

In our regressions we expect deaths, injuries, kidnappings, and building destruction to follow the aforesaid relations between price changes and violence. The sexual assaults parameter is harder to predict. For one thing, there is no previous research on its relation to commodity prices, why we regard it interesting to include as a variable. Moreover, when hypothesising an implied result, at least two opposing aspects become clear: on the one hand, there seems to be no apparent, direct connection between appropriation of wealth and sexual assaults in a context of general crime; on the other, sexual violence is used as a weapon in some armed conflicts and insurgencies (UN Security Council, 2019).

For the general violence test, the corresponding research questions are:

- Do positive price fluctuations in labour intensive commodities affect violence disproportionately more negatively in production intense districts compared to non producers?
- Do positive price fluctuations in capital intensive commodities affect violence disproportionately more positively in production intense districts compared to non producers?

## 4.2 Commodity Prices and Ownership Structure

The second area of interest is that of ownership structure. Are the effects discussed above enhanced by certain forms of plantation estates? Previous work on commodity prices and violence has not explored the possibility that ownership structure could influence the level of violence, and this would therefore be an interesting contribution to current research (that ownership structure affects wages is established in other areas of study [Jovanovic and Lokshin, 2004]). Certain types of ownership structures might enhance or decrease the effects of the different channels that influence the relation between price fluctuations and violence. Small holder estates might for instance be more severely affected by lower prices since they often sell crops directly to consumers, or, alternatively, they might be more resilient if they have a more diversified crop plantation. Falls in international commodity prices might affect profits more than wages in the case of private or government estates, as wages tend to be sticky. On the other hand, falling prices could also potentially mean layoffs, which would affect farmers in private and government estates differently compared to those in small holder estates (where the crop is owned by the worker). As there are no studies testing this relation, it can unfortunately not be contrasted to, or hypothesised in light of, previous research.

In regard to ownership, then, the question is simply:

- Does the ownership structure of the production influence the results?

## 4.3 Commodity Prices and Channel Effects

Lastly, do the effects work through the theorised channels? The opportunity cost effect, supported by Dube and Vargas but not by Bazzi and Blattman, should make wages and employment numbers go up as prices increase. Once again, a degree of inconclusiveness is implicitly suggested by the discussion around perennial commodities. The rapacity effect implies that price hikes lead to increased local government budgets, estimated as capital-related district rents and resources that may be targeted for predation.

Bazzi and Blattman express criticism toward the tendency in conflict economic research to exclude or underestimate the state capacity effect (also absent in Dube and Vargas), which is more commonly and thoroughly discussed in political science, (e.g. Fearon and Laitin, 2003; Ross, 2001; Snyder, 2006), and they bring forth the state capacity effect as the likely reason for why they do not find support for the theorised positive relationship of price changes in capital intensive goods and conflict. This, combined with Bazzi and Blattman's explicit call for more case studies like that on Colombia, lead us to deem it interesting and important to test for the state capacity in the country-specific context. Furthermore, as pointed out in Section 3.2, Indonesia's decentralisation process and high degree of revenue sharing in the natural resource sector makes it a particularly interesting case to study in regard to both the rapacity and the state capacity effect. Concerning the theoretically suggested result, local governments should, although their assets become more attractive to seize as income rises, also possess a greater capacity in defending said income as the overall state presence increases along with capital and law expenditure.

Finally, for the channel effects, the question formulated is:

- Do the effects move through the theorised channels of opportunity cost and rapacity effect, and is there evidence for the state capacity effect counteracting the rapacity effect?

# 5 Data

## 5.1 National Violence Monitoring System (NVMS)

The National Violence Monitoring System (NVMS) or Nasional Pemantauan Kekersan (SNPK) is an effort to document and provide data for analysis on conflict and violence in Indonesia. The NVMS project is jointly led by the Coordination Ministry for Human Development and Culture of Indonesia, the Habibie Center and the World Bank through the Korea Economic and Peacebuilding Transition Trust Fund. NVMS defines violence as "actions, both between individuals as well as groups that cause or may cause physical impact on humans or property" (National Violence Monitoring System Indonesia, 2019) and thus include violence committed in both a conflict-related and a general criminal context. The data is collected on province and district level. The data includes, beside the geographical specification, the nature of the violence and its impact on the local community. The methodology is based on violence reported in local newspapers since 1997. The collection and processing of the data is conducted by JRI Research. The data has been accessed through the World Bank and covers the years 1997-2014 (The World Bank, 2016). Observations are reported on a daily basis based on the date of the attack and the dataset used includes 232,772 observations (National Violence Monitoring System Indonesia, 2019).

The basic trends in the NVMS dataset are presented in five different graphs seen in Figure 1. For all graphs, we would, ceteris paribus, expect to see an increase over time due to the fact that more and more districts are included in the NVMS data collection. Despite that more regions continuously were included in the NVMS data collection (independent of the actual increase of the number of districts in the country described in Section 3.2.), deaths, kidnappings, and building destruction all peak some time during the years 1998-2005. This underscores the development described in Section 3.1 of these years being particularly violent. One potential problem on this matter is that the reason for initiating data collection for certain provinces and districts later than for others is not entirely random. In some cases, it is due to the fact that these districts were too conflict-stricken for researchers to be able to collect high quality data. This discussion is further developed in Section 6.4.1. As can be deduced from the large standard deviations (relative to their respective means) in Table 1, the variance in violence across different districts and years is substantial.

Figure 1: Summary of Total Violence

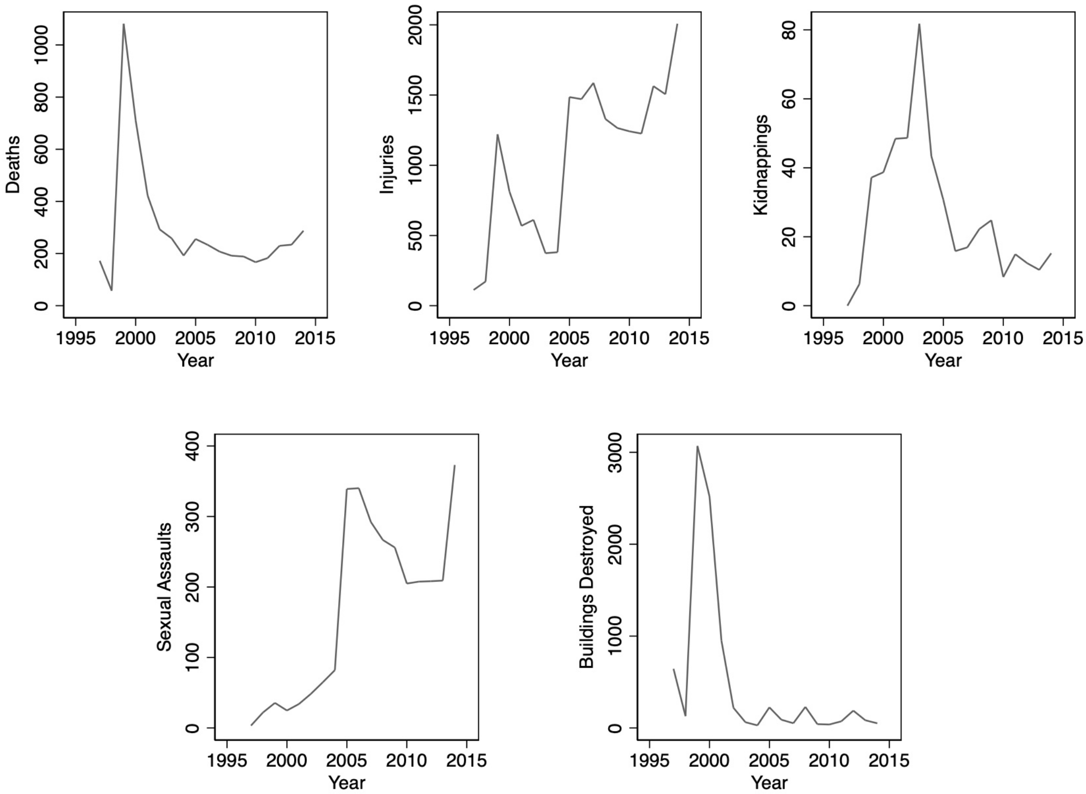


Table 1: Summary of Statistics of Violence at District Level

| | Obs. | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| Deaths | 3,990 | 1.345045 | 7.365046 | 0 | 306.50 |
| Injuries | 3,990 | 4.745911 | 10.95224 | 0 | 229.00 |
| Kidnappings | 3,990 | .1193463 | .706872 | 0 | 25.78 |
| Sexual Assaults | 3,990 | .754947 | 1.325382 | 0 | 16.42 |
| Buildings Destroyed | 3,990 | 2.180498 | 24.35989 | 0 | 1002.50 |

*Notes*: Annual-level variables. Data obtained from the NVMS.

### 5.2 The Indonesia Database for Policy and Economic Research (INDO-DAPOER)

The Indonesia Database for Policy and Economic Research (INDO-DAPOER) is a dataset from the World Bank. It contains numerous different socioeconomic indicators at district and province level. The four main categories of data are: social, demographic, fiscal, and infrastructure (The World Bank, 2019). INDO-DAPOER will be used for data on palm oil production, for control variables relating to socioeconomic factors, and for parameters relating to the channel effects.

The main problem of the INDO-DAPOER dataset is that the quality of data varies significantly. For example, most control variables have very few, or no data points for the early years of the time period. The data used in the regressions (displayed below in Table 2) includes the INDO-DAPOER variables and is in the case of the age groups, HDI, and urbanisation rate trended for the years for which data is missing. The exact method of these approximations is outlined in Section 6.3.4. HDI is an important control variable which covers fundamental socioeconomic variance across districts. The measurements comprising HDI are life expectancy, education, and per capita income.

In Table 2, ownership structure of the production is included. From the table of summary statistics it is clear that the dominant ownership structure in 2009, the year for which data on palm oil production is used, was private estates, followed by small holders estates, and then government estates. In order to be able to compare ownership structures to total palm oil production, the production intensity will be based on the 2009 level instead of 2013, for which no division of ownership is available (see 6.4.4 for further discussion around production intensity).

The employment rate showcased in Table 2 is calculated through dividing total people employed by total labour force for each district and year (both parameters from INDO-DAPOER) as no data on the outright district employment rate exist, and since the World Bank defines its national level employment rate figures in this manner. As is indicated by the maximum value in the table, the calculated employment rates become close to 1 for some districts. However, since the calculation is consequent across all districts, and the mean and standard deviation are furthermore completely reasonable (Indonesia's actual national employment rate, according to the World Bank, has fluctuated between 0.92 and 0.96 during the studied period), this is not deemed to be a significant concern.

Table 2: Summary of Statistics from INDO-DAPOER at District Level

| | | Obs. | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|---|
| 1. | Palm oil Total Production | 9,252 | 15.31769 | 44.29978 | 0 | 413.84 |
| | Palm oil Private Estates Production | 9,252 | 8.13496 | 28.26628 | 0 | 371.46 |
| | Palm oil Small Holders Production | 9,252 | 5.95606 | 17.96477 | 0 | 152.85 |
| | Palm oil Government Estates Production | 9,252 | 1.22668 | 6.56257 | 0 | 83.72 |
| 2. | Total Population | 7,418 | 533,846 | 587,292 | 12,607 | 6,398,000 |
| | Population, aged <15 | 7,450 | 150,711 | 198,697 | 4,228 | 1,315,628 |
| | Population, aged 15-64 | 7,450 | 336,584 | 392,215 | 3,460 | 3,103,642 |
| | Population, aged >64 | 7,399 | 24,810 | 31,378 | 75 | 186,262 |
| | HDI | 7,487 | 68.645 | 5.758 | 42.867 | 81.001 |
| | Urbanisation Rate | 7,329 | .3849 | .3173 | .0024 | 1 |
| 3. | Household Expenditure per capita | 6,766 | 355,890 | 256,392 | 28,478 | 2,248,905 |
| | Personnel Expenditure per capita | 5,676 | 1,002,724 | 918,549 | 4,786 | 1.01e+07 |
| | Employment Rate | 3,839 | .93744 | .03591 | .77853 | .99895 |
| 4. | Tax Revenue Sharing | 6,076 | 3.85e+10 | 7.09e+10 | 1.08e+07 | 2.73e+12 |
| | Natural Resource Revenue Sharing | 5,758 | 4.40e+10 | 1.87e+11 | 662,000 | 4.54e+12 |
| | Own Source Revenue | 7,117 | 5.13e+10 | 1.32e+11 | 1,833,333 | 3.31e+12 |
| 5. | Law-enforcement Expenditures | 3,863 | 6.81e+09 | 7.91e+09 | 5,000,000 | 2.42e+11 |
| | Capital Expenditures | 5,672 | 1.53e+11 | 1.77e+11 | 7.97e+07 | 4.75e+12 |

*Notes*: 1. Production Intensity Variables, 2. Control Variables, 3. Opportunity Cost Parameters, 4. Rapacity Effect Parameters, 5. State Capacity Parameters. Annual-level variables in thousands of hectares for 2009 for palm oil production. Data obtained from INDO-DAPOER.

### 5.3 The Badan Pusat Statistik (BPS) 2013 Agricultural Census

The Badan Pusat Statistik (BPS), or Statistic Indonesia, conducted an agricultural census in 2013. From this census, production data on a district level from 2013 for a number of additional plantation crops (seen in Table 3) is extracted. In the census, no data on ownership structure is reported. The data collected is given in square meters and subsequently converted to hectares in order to match the data from the World Bank (Badan Pusat Statistik, 2013).

Table 3: Summary of Statistics of Production Intensity at District Level

| | Obs. | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| Cocoa Production | 8,946 | 2.20762 | 6.80927 | 0 | 74.93411 |
| Rubber Production | 8,946 | 9.13902 | 23.39144 | 0 | 184.4037 |
| Coffee Production | 8,946 | 2.13969 | 8.90397 | 0 | 110.2552 |
| Tea Production | 8,946 | .03599 | .31016 | 0 | 4.87966 |

*Notes*: Annual-level variables in thousands of hectares, 2013. Data obtained from the BPS.

### 5.4 The Indonesian Ministry of Energy and Mineral Resources

One of the many missions of the Indonesian Ministry of Energy and Mineral Resources is mapping the geological resources that exist in Indonesia. The ministry provides data to the public through its GeoRIMA (Geological Resource of Indonesia Multiplatform Application) platform, where the reserves of several different metals are listed on a district level. Since production data is not publicly available at a district level, reserves will be used as a proxy for production for the capital intensive commodities (for further discussion on reserves see Section 6.1). The data used is for 2015, the earliest year for which data is available. The largest reserves on a district level are those of gold, silver, copper, and tin (GeoRIMA, 2018).

Table 4: Summary of Statistics of Reserve Intensity at District Level

| | Obs. | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| Coal Reserves | 9,252 | .02488 | .17485 | 0 | 2.77 |
| Phosphate Reserves | 9,252 | .04540 | .69402 | 0 | 15.00 |
| Tin Reserves | 9,252 | 25.14184 | 434.2648 | 0 | 9,089.33 |
| Lead Reserves | 9,252 | 3.42779 | 60.89899 | 0 | 1,351.35 |
| Gold Reserves | 9,252 | 694.5878 | 7,139.031 | 0 | 131,612.70 |
| Copper Reserves | 9,252 | 85.03919 | 818.1197 | 0 | 13,945.12 |
| Zinc Reserves | 9,252 | 1.30478 | 22.78504 | 0 | 509.64 |
| Silver Reserves | 9,252 | 28.15173 | 456.08 | 0 | 9,903.17 |

*Notes*: Annual-level variables in millions of tonnes, 2015. Data obtained from GeoRIMA.

### 5.5 Commodity Prices

Unlike Dube and Vargas, we will not use internal prices for the commodities tested. Instead, world market prices will be used in order to achieve a sufficient degree of exogeneity, as to not allow for reverse causality. Indonesia is a large producer of some of the commodities tested, but since we are not concerned with internal prices, the possibility of reserve causality will be considered limited, and especially so when viewed on a commodity-aggregate level. Data on world market prices in Indonesian Rupiahs (IDR) is not available for the entire time period studied. Instead, prices will be collected in USD and then converted to IDR. The reason for choosing IDR as the currency is due to the fact that the price that producers face is IDR, and not USD. Nevertheless, we also conduct supplementary regressions with USD instead of IDR (see Table 16, 22, 28, and 29, all in the appendix) to test if the results hold for both currencies. The exchange rate is accessed from Trading Economics (2020).

Throughout the thesis, the mean yearly price, as opposed to the initial opening price of the first month of the year, will be used in order to better reflect the price level that producers face, considering that they sell the commodities continuously, or at least at different points in time, over the year.

Table 5: Summary of Statistics for Prices

| | Obs. | Mean | Std. Dev. | Min. | Max. | Source |
|---|---|---|---|---|---|---|
| Palm oil (log) | 204 | 15.48277 | .50446 | 14.37744 | 16.10599 | Index Mundi, 2020c |
| Cocoa (log) | 204 | 9.72959 | .48773 | 8.55980 | 10.49966 | Index Mundi, 2020a |
| Coffee (log) | 204 | 9.45238 | .50800 | 8.62852 | 10.17626 | Index Mundi, 2020b |
| Rubber (log) | 204 | 9.52152 | .734848 | 8.09066 | 10.65203 | Index Mundi, 2020e |
| Tea (log) | 204 | 9.77692 | .33751 | 8.77955 | 10.2053 | Index Mundi, 2020d |
| Copper (log) | 204 | 17.32953 | .77781 | 15.8054 | 18.21497 | The World Bank, 2020 |
| Zinc (log) | 204 | 16.41863 | .52893 | 15.26188 | 17.21583 | The World Bank, 2020 |
| Tin (log) | 204 | 18.30256 | .75775 | 16.7142 | 19.37403 | The World Bank, 2020 |
| Phos. (log) | 204 | 13.35797 | .81669 | 11.5574 | 14.7098 | The World Bank, 2020 |
| Lead (log) | 204 | 16.08375 | .77986 | 14.51138 | 17.02821 | The World Bank, 2020 |
| Coal (log) | 204 | 13.04894 | .66099 | 11.63464 | 14.00958 | The World Bank, 2020 |
| Gold (log) | 204 | 15.25021 | .51772 | 14.14607 | 16.07967 | The World Bank, 2020 |
| Silver (log) | 204 | 11.40749 | .81616 | 9.66628 | 12.63958 | The World Bank, 2020 |

*Notes*: Annual-log variables for prices. Data obtained from IndexMundi and the World Bank.

# 6 Methodology

## 6.1 Empirical Strategy

The main empirical strategy makes use of a difference-in-difference estimator in order to examine whether changes in international commodity prices affect violence disproportionately more in districts with a high level of production intensity in the commodities.

To have production intensity be continuous over time would entail a significant endogeneity issue, since the price level and the production intensity is correlated. Thus, similar to Dube and Vargas's approach, a specified year is used for production data for each commodity and district, and this number is then held constant such that production intensity is the same across all years, although it, of course, varies between the individual districts. The temporal variation is therefore provided by the changes in international prices.

However, a slight degree of the endogeneity problem still exist for the production data on the labour intensive commodities. This is due to the fact that there is no data available from the start of, or before, the studied period, and that the production intensity for a given year is to some extent inherently linked to the price level of that year. If prices for those years are extraordinarily high (low), production levels may be altered by endogenous forces, i.e. have shifted to (away from) the crop in question and the production intensity measure might thus become misleading and skew our results. Still, missing data is not necessarily the bottleneck in this case, as an additional problem of using production data from the initial years would be that prices were generally highly abnormal from a historic perspective as a consequence of the Asian financial crisis, which severely affected the Indonesian economy. Dube and Vargas solve this problem with a model that predicts coffee production intensity based on rainfall, temperature and humidity. We have not been able to access similar models for the other agricultural commodities nor the required data for running these potential models. On the basis of data availability and the endogeneity issue discussed above, palm oil production intensity is based on the production levels in 2009 and those of the other perennial crops are based on production levels in 2013.

For the capital intensive commodities, reserve intensity (from 2015) is used instead of production intensity (as per Section 5.4). Since mineral reserves vary significantly less over time than agricultural crop production, the concern of endogeneity is close to nullified for the capital intensive commodities.

Another methodologically important issue is that of prices potentially covarying between different commodities or goods. If such covariance is present, it may complicate the causality linkage of the conducted tests, since it means that the price fluctuations are not exogenous. One group of commodities for which this generally is an issue is food goods, studied by Chen et al. (2018). These goods, to a high degree, are substitutes for each other; if, for example, wheat production falls, people tend not to consume less food, but rather merely adjust their consumption to include other crops. As the commodities we examine are heavily exported, rather than traded on the domestic market, they should not entail these concerns in any significant way. Through our tests for multicollinearity (Table 14 and 15), we show that this is also actually the case. Furthermore, testing food crops with internal, national prices would change the assumed theoretical framework. For while changes in national prices in food crops do imply changes in nominal wages in the same direction, they also imply opposite changes in real wages due to the increased cost of food consumption. Thus, as Chen et al. (2018) find, these price changes do not, on a net basis, link negatively with violence through the opportunity cost channel as other labour intensive goods do according to theory and Dube and Vargas.

In conclusion, we will look at minerals and perennial crops in our regressions, using the production/reserve intensity as the key indicator to differentiate between the districts, and prices to provide the temporal variance. The production or reserve intensity will be given by the land cultivated for crops or existing reserves of minerals.

## 6.2 Commodity Price Fluctuations and Civil Unrest

The first of our three main models will regress the fluctuation in international commodity prices with regard to production and reserve intensity on different measures of violence.

The first specified model is given by:

$$\begin{aligned}y_{dpt} = \alpha_d + \beta_t + \delta_1(Palmoil_{dp} * Price_t) + \delta_2(Cocoa_{dp} * Price_t) + \delta_3(Coffee_{dp} * Price_t)\\ + \delta_4(Tea_{dp} * Price_t) + \delta_5(Rubber_{dp} * Price_t) + \delta_6(Copper_{dp} * Price_t) + \delta_7(Coal_{dp} * Price_t)\\ + \delta_8(Gold_{dp} * Price_t) + \delta_9(Lead_{dp} * Price_t) + \delta_{10}(Tin_{dp} * Price_t) + \delta_{11}(Zinc_{dp} * Price_t)\\ + \delta_{12}(Phosphate_{dp} * Price_t) + \delta_{13}(Silver_{dp} * Price_t) + \phi\mathbf{X}_{dpt} + \varepsilon_{dpt}\end{aligned}$$

Where $y_{dpt}$ is violence parameters including deaths, injuries, kidnappings, sexual assaults, and building destruction in district $d$, in province $p$, during time period $t$; $\alpha_d$ is district fixed effects; $\beta_t$ is time period fixed effects; $Commodity_{dp}$ is the production or reserve intensity of the commodity in district $d$, in province $p$; $Price_t$ is the log price of the commodity in time period $t$ ; $\delta_x$ captures the differential effect on the violence parameters in districts that produce more of the commodity; $\mathbf{X}_{dpt}$ is the time-varying control variables, namely: urbanisation rate, HDI, demographic ratios for ages 0-15, 15-64, and 64+, and log of population in district $d$, in province $p$, during time period $t$; $\varepsilon_{dpt}$ is the error term for district $d$, in province $p$, during time period $t$.

Through the INDO-DAPOER dataset it is possible to run our second main regression: whether the different ownership type of the palm oil plantations could have distinct relations on violence. The three types of ownership reported by the INDO-DAPOER are: government, private, and small holder estates.

The specified model for testing ownership structure is given by:

$$\begin{aligned}y_{dpt} = \alpha_{dp} + \beta_t + \delta_1(Cocoa_{dp} * Price_t) + \delta_2(Coffee_{dp} * Price_t) + \delta_3(Tea_{dp} * Price_t)+\\ \delta_4(Rubber_{dp} * Price_t) + \delta_5(Copper_{dp} * Price_t) + \delta_6(Coal_{dp} * Price_t) + \delta_7(Gold_{dp} * Price_t)\\ + \delta_8(Lead_{dp} * Price_t) + \delta_9(Tin_{dp} * Price_t) + \delta_{10}(Zinc_{dp} * Price_t) + \delta_{11}(Phosphate_{dp} * Price_t)\\ +\delta_{12}(Silver_{dp}*Price_t)+\theta_1(ProdPri_{dp}*Price_t)+\theta_2(ProdSmall_{dp}*Price_t)+\theta_3(ProdGov_{dp}*Price_t)\\ + \phi\mathbf{X}_{dpt} + \varepsilon_{dpt}\end{aligned}$$

Where $y_{dpt}$ is violence parameters including deaths, injuries, kidnappings, sexual assaults, and building destruction in district $d$, in province $p$, during time period $t$; $\alpha_d$ is district fixed effects; $\beta_t$ is time period fixed effects; $\delta_x$ captures the differential effect on the violence parameters in districts that produce more of the commodity; $Commodity_{dp}$ is the production or reserve intensity of the commodity in district $d$, in province $p$ (excluding total palm oil production); $Ownership_{dp}$ is the production intensity of palm oil with respect for the ownership structure in district $d$, in province $p$; $Price_t$ is the log price of the commodity in time period $t$; $\theta_x$ captures the differential effect on the violence parameters in districts that produce more of the palm oil with that particular ownership type; $\mathbf{X}_{dpt}$ is a vector of control variables that include: log of population, urbanisation rate, HDI, demographic ratios for ages 0-15, 15-64, and 64+ in district $d$, in province $p$, during time period $tt$; $\varepsilon_{dpt}$ is the error term for district $d$, in province $p$, during time period $t$.

## 6.3 Commodity Price Fluctuations and Channel Effects

The third of the three main tests that will be conducted is that of examining the strength of the different channels through which price fluctuations are theorised to affect violence, namely the opportunity cost effect, the rapacity effect, and the state capacity effect.

For the opportunity cost of conflict and violence, the most relevant dependent variables are measures of district employment rate and wages. Since survey level data is not available, district personnel cost per capita is used alongside the employment rate. However, the data for these only stretches back to 2009 and 2002 respectively. Thus, we also look at household expenditure per capita, for which data is available for all years except for 2008.

The rapacity channel will be tested via several different forms of local government income related to capital goods. Due to the process of fiscal decentralisation in Indonesia discussed in Section 3.2, income of district governments have increased in general, adding importance and applicability to the rapacity channel analysis in the Indonesian setting. For dependent variables, we look at the available measures encompassing local state capital income, namely: total own source revenue, which is the total regional revenues collected and managed by the local government itself; total tax revenue sharing, i.e. funds received from the national government based on regional output (the higher output, the higher the funds received); and the natural resource revenue sharing, similar to the total tax revenue sharing parameter but exclusive to natural resources both in funding and allocation (United Nations Development Program, 2016). For total own source revenue, data is available for all years; for the latter two parameters, data is available for all years but 2013 and 2014.

Highly tangent to the same phenomenon of decentralisation in Indonesia in general, and in its mining sector in particular, is the increased theoretical relevance of the state capacity effect. For as the local governments in Indonesia themselves retain and manage larger and larger funds their ability to defend against illegal appropriation should likewise become greater. Because the state capacity effect has not been tested for in previous country specific research on the topic, precedence is lacking as to which parameters to include to facilitate comparison to earlier results. Still, it is clear that this capacity typically manifests itself through investments in capital goods and technology, e.g. weapons, transportation, and surveillance systems (Bazzi and Blattman, 2014), and therefore we specify the analysis to an investigation of the link between the commodities and the district law and order function expenditure as well as the district capital expenditure, thus considering both a dependent variable that captures direct anti-insurgency measures as well as more general investments in public goods that might increase the personal risk of not abiding the law. For law and order function expenditure, data is missing for all districts for the years 1997-2000, 2005, and 2006; for capital expenditure, data is missing for all districts for the years 1997-2000.

When selecting measures for the channel effects, relevance and accurateness are the most important considerations, why a variable such as goods and services expenditure (which includes expenditures of companies and the district government) is not included as a proxy for wages in the opportunity cost channel, as it is too heavily overlapping with measures of the state capacity effect. Conversely, there are several other applicable variables that would have been interesting to look at in addition to the ones included in the model to enable an even more comprehensive analysis of the channel effects, but for which data is only available at the province level and not at the district level (e.g. GDP expenditure on private consumption for the opportunity cost channel, and GDP expenditure on government consumption and GDP expenditure on grossed fixed capital formation for the state capacity channel).

However, by still including several different ways of measuring the channel parameters, we aim to lessen the likelihood of achieving overall significant results by mere fluke as well as to test the robustness of the results more thoroughly than what has previously been done in the country-specific context. The model for testing the channels will consist of regressing the changes in international prices of commodities on the different channel parameters.

Our specified model for testing the channel effects is given by:

$$\begin{aligned} q_{dpt} = \alpha_d + \beta_t &+ \delta_1(Palmoil_{dp} * Price_t) + \delta_2(Cocoa_{dp} * Price_t) + \delta_3(Coffee_{dp} * Price_t) \\ &+ \delta_4(Tea_{dp} * Price_t) + \delta_5(Rubber_{dp} * Price_t) + \delta_6(Copper_{dp} * Price_t) + \delta_7(Coal_{dp} * Price_t) \\ &+ \delta_8(Gold_{dp} * Price_t) + \delta_9(Lead_{dp} * Price_t) + \delta_{10}(Tin_{dp} * Price_t) + \delta_{11}(Zinc_{dp} * Price_t) \\ &+ \delta_{12}(Phosphate_{dp} * Price_t) + \delta_{13}(Silver_{dp} * Price_t) + \phi \mathbf{X}_{dpt} + \varepsilon_{dpt} \end{aligned}$$

Where $q_{dpt}$ is the employment rate or the log of either household expenditure per capita, personnel expenditure per capita, total own source revenue, total tax revenue sharing, natural resource revenue sharing, law and order function expenditure, or district capital expenditure, for district $d$, in province $p$, during time period $t$; $\alpha_d$ is district fixed effects; $\beta_t$ is time period fixed effects; $Commodity_{dp}$ is the production or reserve intensity of the commodity in district $d$ in province $p$; $Price_t$ is the log price of the commodity in time period $t$; $\delta_x$ captures the differential effect on the channel parameters constituting $q_{dpt}$ in districts that produces more of the commodity; $\mathbf{X}_{dpt}$ is a vector of control variables that include: HDI, urban versus rural distribution of population, age groups, and the log population (population is not included as a control variable in the case of the opportunity cost channel tests where all parameters are already stated either in per capita or as share of the population), in district $d$, in province $p$, during time period $t$; $\varepsilon_{dpt}$ is the error for district $d$, in province $p$, during time period $t$.

## 6.4 Discussions about Methodology

### 6.4.1 Unbalanced Panel

The panel dataset used in the regression is unbalanced, meaning that there are missing values for some districts during the time period. This is due to the fact that NVMS started collecting data from districts and provinces at different times. No missing values exist when data is in fact started to be collected. Another reason for missing values is that NVMS only records instances when at least one parameter of violence is different to zero, and not when violence has been completely absent from the district for that period of time. Thus, under short time periods, e.g. on a daily basis, it is hard to distinguish whether an observation is missing, or if the district did not simply experience any violence. However, this problem is nullified since we collapse the data on a yearly basis, meaning that all districts report several violence incidents for at least one parameter.

One problem that can result from an unbalanced dataset is attrition. Attrition arises when the missing value from the studied subject is correlated with the idiosyncratic error. This can result in biased estimators which would pose an obstacle in establishing the true effect. Since fixed effect are used, some level of attrition is tolerated if it is correlated with the unobserved effect, $a_i$, as this unobserved effect includes the varying propensity of units to drop out of the data collection during the sampling process.

The NVMS provide no information as to the reason certain districts are not reported for until later in the studied period, nor whether this variance in starting years for data collection across districts is correlated with the idiosyncratic error. When viewing the estimators, is it is assumed that missing values in the violence data is not due to attrition.

### 6.4.2 Fixed versus Random Effects

In order to determine which method of analysis that is appropriate, fixed or random effects, Hausman tests are conducted. In the test, the null hypothesis is that the preferred model is random effects. In more detail, the test is whether the unique errors ($u_i$) are correlated with any of the regressors, against the null that they are not. From our Hausman tests (Table 10) we receive p-values that indicate that fixed effects should be used.

Furthermore, we test whether yearly fixed effects are needed in our regressions through the testparm command. The results (displayed in Table 11) show that it is appropriate to include yearly fixed effects and it is therefore adopted in all regressions.

### 6.4.3 Autocorrelation, Heteroskedasticity, and Multicollinearity

Our data and the following regressions may be subject to heteroskedasticity and autocorrelation. However, since the data and the regressions will be in the form of time series the presence of heteroskedasticity will not bias or make the estimators inconsistent. What will be affected is the standard errors, t statistics, and F statistics. In all regressions these tests and standard errors will be adjusted for heteroskedasticity, and the only standard errors presented will be robust (Wooldridge, 2016). From the Wooldridge test for autocorrelation in panel data (Table 12) we know that some of the regressions contain autocorrelation, and from the modified Wald test for groupwise heteroskedaticity (Table 13) we also note that the regressions contain heteroskedaticity. To counter these effects, since our panel data consists of a large number of N and small T (495 different districts and 17 time period years 1997-2014), we use the cluster robust command together with the fixed effects, mitigating the presence of both autocorrelation and heteroskedasticity (Princeton University, 2007).

When using the variance inflation test (VIF) for multicollinearity (Table 14 and 15) we can further conclude that the regressions include multicollinearity. However, this is exclusively for the control variables and yearly fixed effects; no multicollinearity problem exists within the variables of interest. This will therefore not be an issue for our model and our regression results (Allison, 2012).

### 6.4.4 Control Variables

In addition to controlling for differences across districts and time through district and yearly fixed effects, we also include four explicit control variables. These have been selected as to capture the geographical and temporal drivers generally understood to have considerable explanatory power to conflict, crime, and violence. Overall, socioeconomic factors such as regional levels of income, education, and development are considered to be of high importance (Buonanno, 2003 and Lobonţ, Nicolescu, Moldovan, and Kuloğlu, 2017). For these factors, there are innumerable different measurements. In order to increase statistical reliability and to limit the possibility of picking and choosing specific and obscure control variables such as to reach significant results, we use sub-national HDI, a catch-all type of indicator that is among the most well-established and commonly used geographic measurements of economic and societal progress. Since data for the years 1997-2001, 2003, and 2014 is not available at district level, this is instead trended in time on the basis of the years for which data exists. The trending is carried out simply by extending the yearly development implied by the HDI growth rate for each district between 2002 to 2013, i.e. by assuming a constant change factor equal to the compounded annual growth rate in HDI between the two mentioned years. Albeit more mathematically rigorous estimation methods could, of course, be applied, the actual difference is deemed too small to warrant it: when using the above outlined, simple method of estimation on the province level HDI, for which data exists for all years, the differences between all estimations and real observations amount to an average absolute value of 0.88, and a median absolute value of 0.59, which can be compared to the median actual province observation for HDI of 63.70. Another simple way of replacing the missing values would be to instead use the province level HDI, either for all observations or just the missing ones. However, since the variation across districts within each province is significantly greater than the variation across time, this approach is not further considered.

A second important predictor of violence, including of sexual assaults (Esquivel-Santoveña, Lambert, and Hamel, 2013) which we examine as a parameter in our main regression, not explicitly covered by HDI, is urbanisation. The INDO-DAPOER dataset includes data on the urban and rural share of the district population, which is incorporated in our models as a second control variable. The urban percentage is in this dataset based on a score calculated from population density, share of inhabitants working in agriculture, and public service access (schools, markets, hospitals, asphalt road, and electricity installments). Since the rural share and the urban share adds up to 1, one of them is omitted in the model (in this case the rural). Like with HDI, several years of data are missing. Following the same methodology described above, estimation is undertaken to replace the missing values.

Third, age is an aspect frequently controlled for when studying violence. While it constitutes a rougher segmentation than what would be optimal, INDO-DAPOER provides the only publicly available age data on district level, namely population data for the three age groups 0-14, 15-64, and 65 and above, which we also include as a third control in our regressions. Once again, data for various years are missing and the same projection approach is used in its stead.

Lastly, the log population is used as a control variable, also it collected from INDO-DAPOER. Data is reported for all years and no approximation is undertaken.

For the above controls, some data is also missing for all years for a number of districts (less than 0.5, 5, and 10 percent for the population and HDI, age, and urbanisation variables respectively). These districts are simply discarded in the three main regression models. Whether a district has reported data cannot be assumed to be entirely random, since certain cases of missing data are related to conflict or natural disaster. Due to this, and to the fact that parts of the data for the control variables are dependent on our own estimations, we furthermore test if the results hold without controls in Tables 21, 27, 38, and 39, merely using log population and district and yearly fixed effects, removing all other control variables.

Other potentially relevant control variables not covered by HDI or the urbanisation variables for which data is only available as census data at one single year or only at province or national level is religious affiliation, immigration levels, ethnic fractionalisation, measures of natural disasters, and variables for district splitting. As a substitution for the latter two, our results will further be tested by running the model when excluding districts affected by the 2004 Tsunami (Tables 17, 23, 30, and 31) and when excluding new districts created since 2000 out of other already existing ones (Tables 20, 26, 36, and 37).

# 7 Results

## 7.1 Commodity Prices and Violence

Table 6: Summary of Regression Results with Respect to Violence

| | | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| | | Deaths | Injuries | Kidnappings | Sex. Assaults | Building Dest. |
| 1. | Palm oil int. * log price | -0.0233** | 0.0131** | -3.04e-05 | 0.00232*** | -0.0243 |
| | | (0.0104) | (0.00523) | (0.000155) | (0.000656) | (0.0177) |
| | Coffee int. * log price | 0.00934 | -0.0160 | -2.93e-06 | -0.00179 | 0.185 |
| | | (0.0127) | (0.0466) | (0.000978) | (0.0135) | (0.131) |
| | Cocoa int. * log price | -0.0439 | 0.0233 | -0.00276* | 0.00934 | -0.778* |
| | | (0.0548) | (0.0613) | (0.00144) | (0.00662) | (0.433) |
| | Tea int. * log price | -0.923* | -0.427 | -0.0908 | -5.719*** | 0.521 |
| | | (0.552) | (2.461) | (0.0593) | (0.592) | (2.760) |
| | Rubber int. * log price | 0.0115* | -0.00861 | -1.86e-05 | -0.00213* | 0.0147 |
| | | (0.00675) | (0.00966) | (0.000171) | (0.00109) | (0.0208) |
| 2. | Copper int. * log price | -0.000448 | 0.000841*** | -2.92e-06 | 7.36e-05 | -0.00136 |
| | | (0.000298) | (0.000298) | (9.02e-06) | (8.98e-05) | (0.000891) |
| | Coal int. * log price | 7.997** | 10.88** | 0.131 | -0.223 | 29.82** |
| | | (3.717) | (4.437) | (0.112) | (0.879) | (12.50) |
| | Gold int. * log price | -3.29e-05 | -1.36e-05 | 2.74e-07 | 8.91e-06** | -6.50e-06 |
| | | (3.66e-05) | (3.19e-05) | (4.93e-07) | (4.45e-06) | (9.70e-05) |
| | Silver int. * log price | -7.40e-06 | 0.000101* | 1.59e-06 | 3.32e-06 | -0.000257 |
| | | (4.34e-05) | (5.77e-05) | (2.16e-06) | (1.00e-05) | (0.000169) |
| | Lead int. * log price | 0.00526 | 0.00940** | -0.000170 | 0.0114*** | 0.0211 |
| | | (0.00459) | (0.00472) | (0.000149) | (0.00188) | (0.0200) |
| | Tin int. * log price | 0.000402*** | 0.00105*** | 3.09e-05*** | 0.000681*** | -0.000190 |
| | | (9.83e-05) | (0.000209) | (3.95e-06) | (3.11e-05) | (0.000304) |
| | Zinc int. * log price | 0.00350 | 0.0336*** | 0.000380*** | 7.75e-05 | 0.00418 |
| | | (0.00268) | (0.00282) | (5.44e-05) | (0.000963) | (0.00731) |
| | Phos int. * log price | 0.00649 | 0.0637*** | 0.000668 | 0.0373*** | -0.0744 |
| | | (0.0112) | (0.0236) | (0.000608) | (0.00447) | (0.0470) |
| Observations | | 2,695 | 2,695 | 2,695 | 2,695 | 2,695 |

*Notes*: (1.) Labour intensive commodities are shown in the magnitude of thousands of hectares and (2.) capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: each individual regressions' constant, year fixed effect, log of population, HDI, demographic ratios for ages 0-15, 15-64 and 64+, and urbanisation rate. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

As can be seen in Table 6, our regressions on labour intensive commodities yield coefficients with different signs for different measures of violence. Excluding coefficients not separated from 0 with a 95 percent confidence interval, one labour intensive commodity shows a statistically significant result for deaths, one for injuries, and two do so for sexual assaults. Palm oil shows significant coefficients with conflicting signs, with the regressions for sexual assaults and injuries indicating a positive relationship with violence and that for deaths a negative one. For the capital intensive commodities, the theoretically expected outcome is that districts with higher production intensity experience disproportionately more violence as prices rise, through the rapacity effect, meaning that the increase in value and return to capital will be subject to extortionary rent-seeking. Observing the regression results in Table 6 and the different violence parameters, once again disregarding coefficients not separated from 0, we see that two capital intensive commodities have significant coefficients for deaths, six for injuries, two for kidnappings, four for sexual assaults, and one for building destruction.

Apart from two of the coefficients on palm oil, every other instance of significance separated from zero (17 cases) in Table 6 show coefficients with the anticipated sign, in accordance to the bisection of capital and labour intense commodities. 12 of these are significant at the 1 percent level.

To put the coefficients in proportion, consider palm oil and its relation to the number of deaths in the mean producing district. The production intensity for the mean palm oil producing district is 42,330 hectares. A one percent increase in the yearly mean price of palm oil would therefore imply a decrease in the number of conflict related casualties by 0.009, equal to a fall of 0.73 percent to the district mean number of yearly deaths of 1.35. If tin is scaled in the same manner, a one percent rise in the mean yearly price, with a resource intensity of the mean producing district of 1.62 billion tonnes, would imply a spike in deaths of 0.006, or 0.48 percent. For the other significant capital intensive commodity, coal, the corresponding increase in the number of deaths is 0.011 or 0.80 percent.

Following the same approach to understand the magnitude of the coefficients from the regressions on the other violence parameters, said price change translates into increases in injuries compared to the district mean number of injuries of 4.76, of 0.12 percent, 0.31 percent, 0.23 percent, 0.16 percent, 0.36 percent, 0.25 percent, and 0.01 percent for the mean producing district for palm oil, coal, copper, lead, tin, zinc, and phosphate respectively.

Examining the significant coefficients for sexual assaults, a one percent rise in price is suggested to lead to a fall in district assaults of 2.81 percent for tea and increases of 0.13 percent, 0.05 percent, 1.20 percent, 1.45 percent and 0.04 percent for palm oil, gold, lead, tin, and phosphate respectively. Concerning kidnappings, the increases become 0.42 percent of the district mean yearly kidnappings for tin and 0.11 percent for zinc, and, lastly, for building destruction, the significant coefficient for zinc indicates a one percent price increase to result in 1.83 percent more cases of building destruction.

In terms of historic price development, the yearly mean price of palm oil fell 34 percent, or 0.41 log points, between 1998 and 2007. The total implied number of deaths attributable to this 9 year long slump in palm oil prices when aggregating the total production intensity in Indonesia (i.e. multiplying the palm oil coefficient for deaths with the product of the log change in price over the period and the total national number of hectares of palm oil plantation) adds up to 1,365.

Conversely, from 2006 to 2014, the mean price of tin tumbled 47 percent, or 0.64 log points, suggesting a drop in mean yearly district casualties of 0.418, or 31 percent. Translated to a national level, this means a total of 60 fewer deaths in districts with tin resources than if the price had remained constant.

As can be studied in the appendix, these results are generally robust to different samples, specifications, and controls. Table 16, in which the variables are regressed on USD instead of IDR as is the case in the main regression outlined above, show that the aggregate results hold for one more central currency and are not due to exchange rates fluctuations.

Another supplementary regression, where districts that were effected by the 2004 tsunami (the by far most devastating natural disaster in Indonesia's modern history) are excluded, is displayed in Table 17. It suggests that the results are not skewed by natural disasters, a considerable concern in Indonesia which is one the most natural disaster-prone countries in the world.

Over the course of the sample period, many new districts have been carved out of old ones. In Table 20, the results are shown to be similar when restricted to districts with constant boundaries from 1997 through to 2014.

As summarised in Section 5.1 and is indicated in Figure 1, the initial years of the studied period, 1997-2001, were extraordinarily violent and disruptive. Likewise, two regions, Aceh and Papau, have continuously been significantly more insurgence-stricken than the rest, with separatist groups being highly established and active. To demonstrate that the results do not depend too heavily on extreme occurrences of violence, neither temporally nor geographically, normalised regressions where these two regions are excluded is outputted in Table 18 and 19.

Lastly, we also show that the results hold when the control variables (save for log population) are dropped, only controlling for yearly and district fixed effects, in Table 21.

While a couple coefficients flip sign or go from significant to insignificant, and vice versa, across these various controls, the overall result remains the same, with price hikes in labour intensive commodities having no, or just a slight link with decreased levels of violence and ditto in capital intensive goods being clearly associated with increased levels of violence.

## 7.2 Commodity Prices and Ownership Structure

Table 7: Summary of Regression Results with respect to Ownership Structure

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | Deaths | Injuries | Kidnappings | Sex. Assaults | Building Dest. |
| Private Est. int. * log price | -0.0272** | 0.0156** | -9.41e-05 | 0.00224** | -0.0104 |
| | (0.0128) | (0.00633) | (0.000222) | (0.000914) | (0.0266) |
| Small Holder Est. int. * log price | -0.0106 | -0.00976 | 0.000781 | 0.00551 | -0.100 |
| | (0.0447) | (0.0326) | (0.000896) | (0.00522) | (0.153) |
| Government Est. int. * log price | -0.00184 | 0.0333 | -0.00109 | -0.00422 | -0.0309 |
| | (0.0491) | (0.0299) | (0.00108) | (0.00691) | (0.159) |
| Observations | 2,695 | 2,695 | 2,695 | 2,695 | 2,695 |

*Notes*: Palm oil production intensity is shown in the magnitude of thousands of hectares. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: each individual regressions' constant, year fixed effect, urbanisation rate, HDI, demographic ratios for ages 0-15, 15-64 and 64+, log of population, and production or reserve intensity times log price for the other commodities. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Examining the regression results in Table 7, the only ownership structure that renders significant results is private estates, for which the parameters deaths, injuries, and sexual assaults are significant at the 5 percent level. Similar to the regression with total production of palm oil, the coefficient with anticipated sign is that of deaths. Injuries and sexual assaults, in contrast, increases with price.

To understand the magnitude of the coefficients, the production intensity for the mean palm oil producing district with regard to private estates is 33,720 hectares. A one percent increase in the yearly mean price of palm oil would therefore imply a decrease in the number of deaths by 0.68 percent to the district mean number of yearly deaths of 1.35. The same scaling for injuries and sexual assaults imply an increase of injuries by 0.09 percent and an increase of sexual assaults by 0.10 percent, compared to the district mean injuries and sexual assaults of 4.75 and 0.75 respectively. The effect of the price fluctuations seem to increase slightly in magnitude when only viewing private estates compared to total palm oil production. Since only private ownership is significant, the discussion about the impact of ownership structure becomes limited. Nevertheless, as discussed in Section 4.2, it remains a potentially important consideration to obtain a more nuanced view on the relation between commodity prices and violence.

These results are only somewhat robust when testing currency, violent years, violent districts, the 2004 Tsunami. However, the results are robust when dropping all trended control variables since we retain virtually the same ratio of significant results and the ratio with anticipated signs (Tables 22-27).

## 7.3 Commodity Prices and Channel Effects

When viewing the results from the different channels, labour intensive goods are of principal interest for parameters relating to the opportunity cost channel, as are capital intensive commodities for discussing the results for the rapacity effect and state capacity. As described earlier, the discussion will be limited to results that are significant at a five percent level or lower.

For the parameters representing the opportunity cost channel, the anticipated sign for the coefficients is positive, since employment and our proxies for wages should increase with price. Five coefficients are significant at the five percent level and of these two show a positive relation. Examining the first proxy for wages, household expenditures, we see two positive and one negative coefficient. Scaling the effect of a one percent increase in yearly price by the mean production intensity of the respective commodities yields that household expenditures increase with 0.15 percent, decreases with 2.03 percent, and increases with 0.57 percent for coffee, tea, and rubber respectively, for the mean producing district. The corresponding change for the other proxy for wages, personnel expenditures, is a decrease of 1.72 percent for tea producing districts. Finally, a one percent increase in the yearly price reduces the employment rate by 0.1 percentage points in rubber producing districts.

For the parameters representing the rapacity effect, the anticipated sign for the coefficients is positive, since our proxies for wealth should increase with price. 16 coefficients of capital intensive commodities are significant at the five percent level or lower, and of these 12 show a positive relation to price. The first proxy, tax revenue sharing, is significant for five commodities, where all but copper show the expected sign. A one percent increase in yearly mean price results in a decrease of 0.16 percent and increases of 0.45, 0.12, 0.22, and 0.04 percent for copper, coal, silver, zinc, and phosphate respectively for the mean resource district. The same scaling for the second parameter, natural resource revenue sharing, results in falls of 0.56, 1.48, 0.33 percent, and increases of 0.18, 0.24, and 0.32 percent for copper, coal, silver, lead, tin, and phosphate. The third parameter for rapacity, own source revenue, decreases by 0.03 percent and increases by 0.54, 0.30, 0.08, and 0.03 percent with a one percent increase in yearly price of lead, coal, silver, zinc, and phosphate respectively.

The last effect examined is state capacity, for which the anticipated sign is positive since the state should be able to better defend its resources as its income increases. Once again, most relevant are the capital intensive commodities, since they represent wealth that could be to seized through illegal, violent activities. When examining the coefficients for capital intensive commodities, eight are significant at the five percent level or lower. One commodity show one negative relation: that of capital expenditure for copper, with the other seven coefficients displaying the expected, positive relation. Scaling the first parameter for state capacity, law expenditure, in the same manner as above, results in increases of 0.12, 0.21, and 0.17, percent for silver, lead, and tin. Lastly, a one percent increase in the mean yearly price leads to capital expenditure falling by 0.16, and increasing by 0.01, 0.07, 0.07, 0.03, percent for copper, silver, lead, zinc, and phosphate respectively.

These results are also generally robust when taking into account currency, violent years, violent districts, the 2004 Tsunami, new and split districts, and when removing all controls except log population. When excluding all other control variables we retain virtually the same ratio of significant results and the ratio with anticipated signs (Tables 28-39).

Table 8: Summary of Regression Results with Respect to Channels

| | | (1) | (2) | (3) |
|---|---|---|---|---|
| | | Opportunity Cost Effect | | |
| | | Household expenditure p.c. (log) | Personnel expenditure. p.c. (log) | Employment rate |
| 1. | Palm oil int. * log price | -1.60e-05 | 0.000299 | 6.95e-05 |
| | | (8.52e-05) | (0.000219) | (4.70e-05) |
| | Coffee int. * log price | 0.000680** | 0.000380 | -0.000303 |
| | | (0.000288) | (0.000802) | (0.000293) |
| | Cocoa int. * log price | 0.000377 | -0.000345 | 2.36e-05 |
| | | (0.000550) | (0.00171) | (0.000199) |
| | Tea int. * log price | -0.0565*** | -0.0463*** | 0.00582 |
| | | (0.0148) | (0.0156) | (0.00354) |
| | Rubber int. * log price | 0.000623*** | 0.000247 | -0.000109*** |
| | | (0.000138) | (0.000223) | (3.28e-05) |
| 2. | Copper int. * log price | 2.06e-06** | -1.87e-06 | 3.38e-07 |
| | | (8.12e-07) | (4.09e-06) | (4.03e-06) |
| | Coal int. * log price | 0.0114 | 0.0692* | 0.00933** |
| | | (0.0117) | (0.0386) | (0.00412) |
| | Gold int. * log price | 2.28e-06*** | -4.26e-07 | -2.20e-08 |
| | | (7.89e-07) | (1.56e-06) | (1.34e-07) |
| | Silver int. * log price | 3.20e-05*** | 1.14e-05*** | -2.79e-06*** |
| | | (1.28e-06) | (2.28e-06) | (3.16e-07) |
| | Lead int. * log price | -5.85e-05*** | -2.57e-05 | 1.51e-05*** |
| | | (1.54e-05) | (3.53e-05) | (4.99e-06) |
| | Tin int. * log price | -6.78e-07 | 4.08e-06 | -3.82e-06* |
| | | (2.43e-06) | (1.28e-05) | (2.07e-06) |
| | Zinc int. * log price | 0.000111*** | 0.00126*** | -5.76e-05*** |
| | | (3.28e-05) | (9.10e-05) | (1.13e-05) |
| | Phos. int. * log price | -0.00435*** | 0.00259*** | -0.000647*** |
| | | (0.000467) | (0.000688) | (4.17e-05) |
| Observations | | 5,747 | 4,716 | 3,112 |

*Notes*: (1.) Labour intensive commodities are shown in the magnitude of thousands of hectares and (2.) capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: each individual regressions' constant, year fixed effect, urbanisation rate, HDI, demographic ratios for ages 0-15, 15-64 and 64+, and log of population. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 9: Summary of Regression Results with Respect to Channels

| | | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| | | | Rapacity Effect | | State Capacity | |
| | | Tax Sharing (log) | Natural Res. Shar. (log) | Own rev. (log) | Law. Exp. (log) | Cap. Exp. (log) |
| 1. | Palm oil int. * log price | -0.000291 | -0.00153 | -0.000242 | 8.92e-05 | -0.00132*** |
| | | (0.000397) | (0.00111) | (0.000302) | (0.00156) | (0.000391) |
| | Coffee int. * log price | -0.000424 | 0.000262 | 0.00220*** | -0.00142 | 0.00130 |
| | | (0.00132) | (0.00282) | (0.000830) | (0.00459) | (0.00170) |
| | Cocoa int. * log price | 0.00243 | -0.0206** | -0.00153 | 0.00543 | 0.00232 |
| | | (0.00230) | (0.00977) | (0.00170) | (0.00889) | (0.00294) |
| | Tea int. * log price | 0.00676 | 0.334*** | -0.0418 | -0.274* | 0.0122 |
| | | (0.0236) | (0.105) | (0.0546) | (0.146) | (0.0317) |
| | Rubber int. * log price | 0.000989** | 0.00468*** | 0.00117** | 0.00161 | 0.00140*** |
| | | (0.000449) | (0.00164) | (0.000547) | (0.00171) | (0.000516) |
| 2. | Copper int. * log price | -1.89e-05*** | -6.63e-05*** | 1.50e-06 | -2.13e-05 | -1.90e-05*** |
| | | (2.63e-06) | (1.17e-05) | (9.05e-06) | (2.37e-05) | (7.20e-06) |
| | Coal int. * log price | 0.180** | 0.595** | 0.217*** | 0.0595 | 0.00934 |
| | | (0.0855) | (0.276) | (0.0668) | (0.186) | (0.0508) |
| | Gold int. * log price | -4.67e-06 | -2.20e-05* | -4.46e-06 | -9.19e-06 | -2.83e-06 |
| | | (3.70e-06) | (1.31e-05) | (3.04e-06) | (6.82e-06) | (2.21e-06) |
| | Silver int. * log price | 4.46e-05*** | -0.000118*** | 0.000105*** | 4.27e-05*** | 3.64e-05*** |
| | | (2.97e-06) | (1.11e-05) | (5.08e-06) | (1.20e-05) | (3.52e-06) |
| | Lead int. * log price | -4.73e-05* | 0.000515*** | -9.46e-05*** | 0.000622*** | 0.000211*** |
| | | (2.81e-05) | (0.000169) | (1.71e-05) | (0.000105) | (8.10e-05) |
| | Tin int. * log price | 1.67e-06 | 9.83e-05** | 1.17e-05 | 6.88e-05** | -3.14e-05* |
| | | (1.01e-05) | (4.15e-05) | (1.75e-05) | (3.38e-05) | (1.66e-05) |
| | Zinc int. * log price | 0.00169*** | 0.00103 | 0.000579*** | 0.000113 | 0.000504*** |
| | | (7.52e-05) | (0.000627) | (0.000135) | (0.000359) | (0.000135) |
| | Phos. int. * log price | 0.00916*** | 0.0696*** | 0.00763*** | 0.00515* | 0.00703*** |
| | | (0.00110) | (0.00367) | (0.000937) | (0.00300) | (0.00140) |
| Observations | | 5,172 | 4,919 | 5,911 | 3,241 | 4,693 |

*Notes*: (1.) Labour intensive commodities are shown in the magnitude of thousands of hectares and (2.) capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: each individual regressions' constant, year fixed effect, urbanisation rate, HDI, demographic ratios for ages 0-15, 15-64 and 64+, and log of population. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

# 8 Discussion

## 8.1 Main Findings in Relation to Previous Research

The aggregate results from the two main tests, that of the relation of commodity prices and violence, and that of the relation of commodity prices and the channel effects, partly follow theory. Most significant coefficients show anticipated signs for both these two overarching tests. The fact that the main results are robust when testing for discernible specifications potentially skewing violence levels or the channel parameters adds credence and allows for a more substantiated discussion.

More precisely, when looking at the share of coefficients with anticipated sign, the results for labour intensive commodities, on aggregate, display no link in the violence test, nor in the channel test through which the opportunity cost effect is examined. Although conflicting with Dube and Vargas's findings on coffee, it too a perennial crop, assuming that perennial crops should be viewed as a hybrid commodity type instead of a pure labour intensive one (which appears reasonable as discussed in Section 3.4 and 4), our result is not at odds with the theoretical framework. If perennial crops instead are considered highly labour intensive, like annual crops, then this is no longer the case and our results, and not those of Dube and Vargas, are contrary to theory. In either case it is in line with the empirical results on perennial crops of Bazzi and Blattman.

The capital intensive commodities, in contrast, indicate a strong relation both in the violence test and in the tests of the rapacity and state capacity channels. Indeed, with all 17 coefficients significant at a 5 percent level having the anticipated sign, our regressions offer substantial support for the positive relationship between price changes in capital intensive goods and violence that is proposed by theory.

Bazzi and Blattman do not find the same support in their cross-country study and argue that the reason is the state capacity effect which they find outweighs the rapacity effect. Around this, they form a legitimate critique toward earlier conflict economic research, implicitly including that of Dube and Vargas, that underestimates or does not consider or test for state capacity. Interestingly, in what perhaps constitutes the most notable scientific contribution of our case study, we find support for the theoretically implied relationship around capital intensive commodities even when the state capacity is tested for and found to be significant.

To quantitatively weigh the rapacity effect against the state capacity effect is in this case not feasible: the parameters for the channels are merely approximate measures of the capacities, in two specific and distinct ways. First, the best proxies found are still imperfect in nature, e.g. natural resources revenue sharing covers more income (including that of other minerals, oil, gas, etc.) than merely the contribution from the commodities tested, and the total law and order expenditure includes (in addition to hereto relevant anti-appropriation investments) government spending that, while related to law enforcement, is not directed toward, and cannot be assumed to have any significant impact on, violence and conflict. Second, it is difficult to conceive of suitable parameters directly measuring actual rapacity and state capacity, and not just fiscal variables that have an indirect effect on the incentives around violence and conflict. Barring such parameters, however precise the measures used may be, any potential model where the two effects are tested mathematically against each other will need to assume a specific relationship between the governmental income and the investments in law enforcement related to the commodities studied on the one hand, and the actual positive incentives to appropriate and the state's capacity to hinder the appropriation-associated violence, on the other.

Nevertheless, a more general conclusion on the channel effects can still be drawn. Like stated above, we find clear support for the positive relationship between violence and price changes in capital intensive commodities. If then, as assumed here and in earlier theory, these three aforementioned effects are collectively exhaustive and no other channels through which commodity prices significantly influence violence exist, the rapacity effect must be dominant, seeing as it is the only one through which changes in prices relate positively to violence.

Having dealt with the issue of ignoring the state capacity, why our results in respect to capital intensive commodities conflict with those of Bazzi and Blattman could have several other explanations. First, our study is country specific and not cross-country. It is possible that Indonesia is not adequately representative for developing nations as a whole on this topic; our discussions around the decentralisation process highlights one aspect in which this may be the case. This concern, however, is mitigated by the fact that we show that our results hold for eliminating the districts whose boundaries have been altered due to the decentralisation reform. Second, as outlined in Section 3.3, the specific commodities that are analysed differ, with Bazzi and Blattman covering a higher number. Third, because their focus is on civil wars and coups and ours on violence in general, the parameters of violence differ. Since, as seen in the in Section 7.1, the implied strength of the relationships vary across violence parameters, this may explain some of the discrepancy. However, if the parameter "deaths" in our regressions on violence is assumed to be adequately comparable to their main violence measure, "battle- and coup-related casualties", this account becomes limited as both significant coefficients for capital intensive commodities show the anticipated sign.

## 8.2 Other Findings

One of our parameters, sexual assaults, is seemingly, as discussed in Section 4, different in nature from the rest, with clear opposing plausible aspects to consider when hypothesising about its relation to commodity prices. Yet, our results indicate that sexual assaults is one of the violence parameters that have the strongest relation to price changes. Given that there is no earlier research to which the results can be compared, conclusions drawn should encompass certain caution. With that said, it seems like sexual violence, in the context of changing commodity prices, either simply works through the same channels as non-sexual violence or, alternatively, also/rather works through other noteworthy effects which have not yet been explicitly considered by theory (doing so with a similar net result to that of the other parameters). If the latter, it does not seem untenable that one of these potential effects could relate to wartime sexual violence which was discussed in Section 4.

The discussion about ownership structure becomes restricted due to the lack of significant results and, above all, lack of regional data on ownership composition for commodities other than palm oil. As per the discussion in Section 4 and 6.1, it still appears plausible that ownership structure could influence the relationships tested, and thus it remains something that potentially could be a valuable inclusion in future tests, particularly for research that prescribes policy suggestions.

## 8.3 On Variance and Causality

Examining what type of variance might drive our results, prices and production intensity are both relevant to analyse. The period studied is subject to large volatility in prices, with the Asian crisis and the financial crisis both included. However, the differences between min. and max. values in log prices (as can be seen in Table 5) are of similar, relatively moderate, magnitude, and there is no dramatic divergence between the commodities that are significant and those that are not. Instead, the lion's share of our variation stems from production intensity, rather than price. While this variation in production is large in general, with standard deviations multiple times larger than the means for all commodities (as can be seen in Table 2, 3, and 4), the production of the capital intensive commodities is particularly concentrated to a few, albeit different, districts (resulting in the large standard deviations shown in Table 4). It is possible that this difference can be one driver for the overall higher significance of the capital intensive commodities. Since the prices used are international and thus the same for all districts, and the production intensities are held constant across all years, the above also implies that the bulk of the variance arises from regional, not temporal, differences in the data.

When it comes to inferring causality, the main factor to consider is the question of endogeneity; here related to the degree to which concerning price levels and production intensity are interlinked. As stated in Section 5.5, the prices chosen are world prices and should generally be exogenous to Indonesia. However, Indonesia is a large producer of some of the commodities studied, meaning that there exist a possibility of reverse causality. To which degree this is a concern, varies between commodities. In the case of palm oil, for which Indonesia is the world's largest producer by far (as highlighted in Section 3.3), this is a substantial problem. In that of coffee, Indonesia is the fourth largest and the problem is similar, but smaller. Worth noting is that Colombia (the setting for

Dube and Vargas's study) is the third largest producer of coffee (one of the two commodities whose regression results they build their main findings on). On a commodity-aggregate level, we deem that this influence does not constitute a substantial concern, especially since Indonesia is not a major producer of the capital intensive commodities, which are the ones we draw our principal conclusions from.

Also, as discussed in Section 6.1, the year for which the production intensity is chosen can also result in a degree of endogeneity. Ideally, although here not possible due to lack of data availability, the production intensity should be based on the first time period or a date slightly before the entire studied period. However, neither this is significant for our central verdicts, since this issue too is small for our measures on capital intensive commodities; reserves are generally not season- or price-sensitive.

# 9 Conclusions and Future Research

On an aggregate level, no support is found for the theorised negative relationship between price fluctuations in labour intensive commodities and violence, and strong support is found for the theorised positive relationship between price fluctuations in capital intensive commodities and violence. For labour intensive commodities, one key issue is the assumptions around perennial crops. In terms of the underlying channels, the result is ambiguous for labour intensive commodities and clear for capital intensive ones; support is found for both the rapacity effect and the state capacity effect. The results also imply that the linkage between sexual violence and commodity prices follows that of other types of violence. Ownership structure might influence the effect of price on violence, but no major conclusions can be drawn due to lack of data and significant results.

Regarding future research, a couple of focus points can be discerned. The theory of Dal Bó and Dal Bó has now proven to have at least partial merit in both the Colombian and the Indonesian setting. However, these are only two out of many countries of interest, and we agree with Bazzi and Blattman's statement that more country-specific studies are needed as they can provide another level of depth and accuracy that is missed when taking a cross-country approach and not differentiating production on a regional level. In addition to the three effects tested in this paper, economic research on the topic should test other channels (and, like Bazzi and Blattman did with the state capacity, look toward political science in search for theorised effects if needed) to achieve a closer approximation of reality and better capture the practical intricacies and complexities of motives and incentives for violence and conflict. As underscored in Section 8.2, this is especially true in the case of sexual violence and for the question of whether ownership structure plays a significant role in the realisation of violence.

Apropos intricacies and complexities; following the discussion around the practically inaccurate dichotomy of the labour versus capital intensive categorisation that is delineated in Section 3.4 and 4, a more precise classification of goods would constitute a substantial scientific contribution. Given that Bazzi and Blattman expand to three types of categories by dividing crops into annual and perennial, a further dissection does not seem implausible.

Another issue of measurement brought forth in Section 8.1 is that of identifying or constructing more accurate measures of rapacity and state capacity such as to be able to quantitatively weigh the two against each other. One conceivable way of doing so would be to use or establish an index respectively that more accurately captured the actual incentives for, and the capacity of defending against, appropriation. These indices could then comprise a clear, comparable scaling of the issue, apt for more detailed numeric modulation. Here, cross-country studies probably have an advantage, since more high quality data is available on national than on sub-national level in general, and in the form of economic and social indices in particular.

As the body of theory and empiricism on the relation of commodity prices and violence grows larger, potential meta-studies would also form a welcomed addition, both for comparison between case studies and for crystallising the takeaways from the various papers into an overarching verdict and a more cohesive and well-founded set of economic concepts. In order for policy suggestions to have potential to gain traction and thus to be worth making, this is likely all but a prerequisite.

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# 10 Appendix

## 10.1 More Commodity Overviews

### 10.1.1 Tin Production

Most of the tin produced in Indonesia comes from the islands of Bangka, where a third of the world's tin emanates from. Police reports show that one miner dies a week in the region. The metal is mostly used in electronics, and demand is increasing (Investing News Network, 2011b).

The legal mining of tin stems from two companies, PT Timah and Koba, both at least partially state-owned. The Indonesian production of tin is mostly conducted in small-scale mining operations in crews of four or five miners supervised by subcontractors. The metal is, however, subject to wast illegal mining with far less safety precautions. The illegal metal ore is often mixed with legal ore before smelting. Many of the illegal mines come in the form of floating dredges that mine the tin ore from the ocean floor (Investing News Network, 2011b).

### 10.1.2 Gold Production

Indonesia is home to the largest gold mine in the world, the Grasberg mine, situated in Papua. Half of the country's gold production emanates from this mine which is currently owned by the American company Freeport-McMoRan Copper & Gold Inc. The American company is also the single largest taxpayer in Indonesia (Indonesia Investments, 2015).

The Grasberg mine in particular, is a source of tension within the local communities in Papua, and violence surrounding the mine is not uncommon. The main reason for these encounters is that inhabitants feel that the wealth created from the mine does not end up sufficiently driving economic development in Papua, but instead is extracted and shifted elsewhere by foreign companies. This contestation is spearheaded by the separatist movements in Papua, but has significant grassroots support across the region.

The largest reserves of gold besides Papua are found in the provinces Sumbawa, East Kalimantan, and Central Kalimantan. Indonesia produces around four percent of the global gold production, of which most is exported abroad (Indonesia Investments, 2015).

### 10.1.3 Copper Production

Indonesia is the world's fourth largest copper producer according to the US Geological Survey. The type of copper found in the country is rich in gold and porphyry, meaning that the copper mines also often holds reserves in gold (Investing News Network, 2011a).

The main party in the regulation of mining in Indonesia is the Ministry of Energy and Mineral Resources. Over the years, mining production has been subject to frequent setbacks due to corruption, protests and violence. Recently, several strategies intended to to counter and clean up the sector, has been rolled out to spur foreign investment in the country. The two most prominent copper mines in Indonesia is the Grasberg mine and the Batu Hijau mine on the island of Sumbawa. Production in the Batu Hijau mine, which is partially foreign owned, has greatly increased in the later years (Investing News Network, 2011a).

### 10.1.4 Coal Production

Indonesia is a large global exporter of coal. The coal in reserves in Indonesia is generally of the medium to lower quality type, for which India and China are large importers. The reserves in Indonesia is expected to last 83 years at the current mining rate according to the Ministry of Energy and Mineral Resources. In relation to the global reserves Indonesia holds 2.2 percent according to BP Statistical Review of World Energy (Indonesia Investments, 2018b).

Even though coal is found in many different provinces in Indonesia, the largest reserves are in South Sumatra, South Kalimantan and East Kalimantan. The industry is rather fragmented and not subject to many large corporations. Most coal produced, around 70-80 percent, is exported (Indonesia Investments, 2018b).

### 10.1.5 Coffee Production

Indonesia is one of the largest producers of coffee in the world. Most of the coffee produced in the country is of the lower quality robusta type. Today, Indonesian coffee plantations cover an area of approximate 1.24 million hectares. Most of the coffee plantations, around 90 percent, is owned and cultivated by small-scale farmers with plantations of 1-2 hectares. Compared to other high-producing countries such as Vietnam, Indonesia does not have many large coffee corporations, and growers encounter greater difficulty achieving high production volumes and quality. The output from Indonesia is therefore less competitive on the international market (Indonesia Investments, 2017).

According to Statistics Indonesia, starting in the 1960s, farmers have shifted cultivation of coffee to other crops, mainly palm oil, rubber and cocoa, which have higher yields on the international markets. The main importers of Indonesian coffee are Japan, the US, Western European countries, and South American countries. Approximately 70 percent of the coffee produced in Indonesia in 2012 was exported (Indonesia Investments, 2017).

The most highly coffee producing provinces in Indonesia are Bengkulu, South Sulawesi and Lampung for the robusta coffee bean, and Aceh and North Sumatra for the Arabica coffee bean (Indonesia Investments, 2017).

### 10.1.6 Cocoa Production

The cocoa bean is one of the most important agricultural export products of Indonesia. The production has increased during the last 25 years due to small holders' heightened involvement in the plantation. In the production of cocoa, large corporations and state-owned enterprises have a certain presence but today most of the production is conducted by small holders. Across Indonesia approximately 1.5 million hectares of cocoa is planted. The main producing provinces of cocoa in Indonesia is Sulawesi, North Sumatra, West Java, Papua, and East Kalimantan, with 75 percent of the production being located on the Sulawesi island. Productivity per hectare is generally lower in Indonesia compared to other countries due to aging trees, insufficient investment, and poorer farm maintenance. Most of the exports of cocoa go to Malaysia, the US and Singapore, and cocoa income constitutes the forth largest foreign exchange earnings in the agriculture sector (Indonesia Investments, 2018c).

### 10.1.7 Rubber Production

Due to the rubber tree's specific climate requirement of high temperatures year round and large humidity, most of the natural rubber produced globally come from Southeast Asia. Together with Thailand and Malaysia, Indonesia produces 70 percent of the global production. The rubber tree takes seven years before its productive age and produces rubber for 25 years, making short-term demand adjustments difficult (Indonesia Investments, 2018a).

The production of rubber in Indonesia has grown steadily since the 1980s, and is mainly produced by small holders (approximately 80 percent). As with the cocoa industry, state owned enterprises and large private actors play only a minor role. In 2016, rubber plantations covered 3.64 million hectares across Indonesia. Most of the production come from South Sumatra, North Sumatra, Riau, Jambi, and West Kalimantan. Many growers have shifted to rubber production production from other commodities due to the good outlook of the crop. Particularly, small holders have shifted production and to a lesser degree stated owned enterprises, however, they remain more focused on palm oil production (Indonesia Investments, 2018a).

Indonesia exports around 85 percent of the rubber produced and almost half of that is to other Asian countries. However, the single largest importing country is the US. As with many other commodities the productivity level is lower in Indonesia compared to Vietnam, Thailand, and Malaysia (Indonesia Investments, 2018a).

#### 10.1.8 Tea Production

In recent years, significant portions of Indonesian tea production have shifted to more lucrative agricultural commodities, such as palm oil. Even though the amount of hectares used for plantation has shrunken as a consequence of this, the production in tonnes have been relatively stable over time, as advancements in cultivation technologies have increased productivity. Today, Indonesia is the 7th largest producer of tea but the international market is dominated in by China and India which together stand for almost half of the world's output. The most productive provinces in Indonesia are West Jawa, Central Jawa and Northern Sumatra. West Jawa produces almost 70 percent of total Indonesian output. (Indonesia Investments, 2016).

## 10.2 Statistical Tests

Table 10: Hausman Test for Random or Fixed Effects

| | Commodities and Violence | | | | |
|---|---|---|---|---|---|
| | Deaths | Injuries | Kidnap. | Sex. Assaults | Build. Ds. |
| Prob>chi2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | Ownership Structure and Violence | | | | |
| | Deaths | Injuries | Kidnap. | Sex. Assaults | Build. Ds. |
| Prob>chi2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | Opportunity Cost Channel | | | | |
| | House. Exp. | Pers. Exp. | Emp. Rt | | |
| Prob>chi2 | 0.0000 | 0.0002 | 0.0000 | | |
| | Rapacity Effect | | | | |
| | Tax Share | Natural. Res. | Own Rev. | | |
| Prob>chi2 | 0.0000 | 0.0000 | 0.0000 | | |
| | State Capacity | | | | |
| | Law Exp. | Cap Exp. | | | |
| Prob>chi2 | 0.0000 | 0.0001 | | | |

*Notes*: H0: differences in coefficients are not systematic.

Table 11: Test for Time Fixed Effects

| | Commodities and Violence | | | | |
|---|---|---|---|---|---|
| | Deaths | Injuries | Kidnap. | Sex. Assaults | Build. Ds. |
| Prob>F | 0.0000 | 0.0309 | 0.0000 | 0.0000 | 0.0000 |
| | Ownership Structure and Violence | | | | |
| | Deaths | Injuries | Kidnap. | Sex. Assaults | Build. Ds. |
| Prob>F | 0.0000 | 0.0310 | 0.0000 | 0.0000 | 0.0000 |
| | Opportunity Cost Channel | | | | |
| | House. Exp. | Pers. Exp. | Emp. Rt | | |
| Prob>F | 0.0000 | 0.0002 | 0.0000 | | |
| | Rapacity Effect | | | | |
| | Tax Share | Natural. Res. | Own Rev. | | |
| Prob>F | 0.0000 | 0.0000 | 0.0000 | | |
| | State Capacity | | | | |
| | Law Exp. | Cap Exp. | | | |
| Prob>F | 0.0000 | 0.0001 | | | |

*Notes*: H0: time fixed effects = 0.

Table 12: Wooldridge Test for Autocorrelation in Panel Data

| | Commodities and Violence | | | | |
|---|---|---|---|---|---|
| | Deaths | Injuries | Kidnap. | Sex. Assaults | Build. Ds. |
| Prob>F | 0.0544 | 0.0000 | 0.3586 | 0.0004 | 0.0023 |
| | Ownership Structure and Violence | | | | |
| | Deaths | Injuries | Kidnap. | Sex. Assaults | Build. Ds. |
| Prob>F | 0.0514 | 0.0000 | 0.3574 | 0.0004 | 0.0023 |
| | Opportunity Cost Channel | | | | |
| | House. Exp. | Pers. Exp. | Emp. Rt | | |
| Prob>F | 0.0000 | 0.0002 | 0.0000 | | |
| | Rapacity Effect | | | | |
| | Tax Share | Natural. Res. | Own Rev. | | |
| Prob>F | 0.0000 | 0.0000 | 0.0000 | | |
| | State Capacity | | | | |
| | Law Exp. | Cap Exp. | | | |
| Prob>F | 0.0000 | 0.0001 | | | |

*Notes*: H0: no first-order autocorrelation.

Table 13: Modified Wald Test for Groupwise Heteroskedasticity

| | Commodities and Violence | | | | |
|---|---|---|---|---|---|
| | Deaths | Injuries | Kidnap. | Sex. Assaults | Build. Ds. |
| Prob>chi2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | Ownership Structure and Violence | | | | |
| | Deaths | Injuries | Kidnap. | Sex. Assaults | Build. Ds. |
| Prob>chi2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | Opportunity Cost Channel | | | | |
| | House. Exp. | Pers. Exp. | Emp. Rt | | |
| Prob>chi2 | 0.0000 | 0.0000 | 0.0000 | | |
| | Rapacity Effect | | | | |
| | Tax Share | Natural. Res. | Own Rev. | | |
| Prob>chi2 | 0.0000 | 0.0000 | 0.0000 | | |
| | State Capacity | | | | |
| | Law Exp. | Cap Exp. | | | |
| Prob>chi2 | 0.0000 | 0.0000 | | | |

*Notes*: H0: $\sigma(i)^2 = \sigma^2$ for all $i$.

Table 14: Test for Multicollinearity on Violence Regressions

| | Commodities and Violence | | | | |
|---|---|---|---|---|---|
| | Deaths | Injuries | Kidnap. | Sex. Assaults | Build. Ds. |
| Palm oil int * log price | 1.45 | 1.45 | 1.45 | 1.45 | 1.45 |
| Coffee int * log price | 1.11 | 1.11 | 1.11 | 1.11 | 1.11 |
| Cocoa int * log price | 1.31 | 1.31 | 1.31 | 1.31 | 1.31 |
| Tea int * log price | 1.03 | 1.03 | 1.03 | 1.03 | 1.03 |
| Rubber int * log price | 1.69 | 1.69 | 1.69 | 1.69 | 1.69 |
| Copper int * log price | 1.29 | 1.29 | 1.29 | 1.29 | 1.29 |
| Coal int * log price | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 |
| Gold int * log price | 1.08 | 1.08 | 1.08 | 1.08 | 1.08 |
| Silver int * log price | 1.01 | 1.01 | 1.01 | 1.01 | 1.01 |
| Lead int * log price | 1.01 | 1.01 | 1.01 | 1.01 | 1.01 |
| Tin int * log price | 1.04 | 1.04 | 1.04 | 1.04 | 1.04 |
| Zinc int * log price | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 |
| Phos. int * log price | 1.04 | 1.04 | 1.04 | 1.04 | 1.04 |
| Mean VIF | 45.07 | 45.07 | 45.07 | 45.07 | 45.07 |
| | Ownership Structure and Violence | | | | |
| | Deaths | Injuries | Kidnap. | Sex. Assaults | Build. Ds. |
| Private Est. int * log price | 1.58 | 1.58 | 1.58 | 1.58 | 1.58 |
| Small Holder Est. int * log price | 2.81 | 2.81 | 2.81 | 2.81 | 2.81 |
| Government Est. int * log price | 1.44 | 1.44 | 1.44 | 1.44 | 1.44 |
| Mean VIF | 43.16 | 43.16 | 43.16 | 43.16 | 43.16 |

*Notes*: VIF test on main regressions for the variables of interest.

Table 15: Test for Multicollinearity on Channel Effect Regressions

| | Opportunity Cost Channel | | |
|---|---|---|---|
| | House. Exp. | Pers. Exp. | Emp. Rt |
| Palm oil int * log price | 1.64 | 1.62 | 1.62 |
| Coffee int * log price | 1.10 | 1.10 | 1.11 |
| Cocoa int * log price | 1.20 | 1.21 | 1.21 |
| Tea int * log price | 1.03 | 1.03 | 1.08 |
| Rubber int * log price | 1.64 | 1.65 | 1.67 |
| Copper int * log price | 1.07 | 1.07 | 1.09 |
| Coal int * log price | 1.11 | 1.11 | 1.11 |
| Gold int * log price | 1.04 | 1.04 | 1.03 |
| Silver int * log price | 1.01 | 1.01 | 1.01 |
| Lead int * log price | 1.01 | 1.01 | 1.02 |
| Tin int * log price | 1.10 | 1.09 | 1.09 |
| Zinc int * log price | 1.06 | 1.06 | 1.10 |
| Phos. int * log price | 1.04 | 1.03 | 1.04 |
| Mean VIF | 18.1 | 14.82 | 61.41 |

| | Rapacity Effect | | | State Capacity | |
|---|---|---|---|---|---|
| | Tax Share | Natural. Res. | Own Rev. | Law Exp. | Cap Exp. |
| Palm oil int * log price | 1.64 | 1.65 | 1.63 | 1.68 | 1.61 |
| Coffee int * log price | 1.10 | 1.11 | 1.10 | 1.10 | 1.10 |
| Cocoa int * log price | 1.20 | 1.20 | 1.20 | 1.21 | 1.21 |
| Tea int * log price | 1.07 | 1.07 | 1.07 | 1.03 | 1.03 |
| Rubber int * log price | 1.66 | 1.65 | 1.66 | 1.66 | 1.66 |
| Copper int * log price | 1.06 | 1.06 | 1.07 | 1.08 | 1.07 |
| Coal int * log price | 1.12 | 1.12 | 1.12 | 1.12 | 1.12 |
| Gold int * log price | 1.04 | 1.04 | 1.04 | 1.03 | 1.04 |
| Silver int * log price | 1.01 | 1.01 | 1.01 | 1.01 | 1.01 |
| Lead int * log price | 1.02 | 1.02 | 1.02 | 1.01 | 1.01 |
| Tin int * log price | 1.10 | 1.10 | 1.10 | 1.11 | 1.09 |
| Zinc int * log price | 1.05 | 1.05 | 1.06 | 1.07 | 1.06 |
| Phos. int * log price | 1.03 | 1.03 | 1.03 | 1.03 | 1.03 |
| Mean VIF | 24.2 | 23.99 | 2.59 | 14.87 | 14.37 |

*Notes*: VIF test on main regressions for the variables of interest.

## 10.3 Robustness Tests

Table 16: Summary of Regression Results with Respect to Violence in USD

| | | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| | | Deaths | Injuries | Kidnappings | Sex. Assaults | Building Dest. |
| 1. | Palm oil int. * log price | -0.0280** | 0.0141*** | -3.25e-05 | 0.00235*** | -0.0208 |
| | | (0.0136) | (0.00496) | (0.000158) | (0.000675) | (0.0215) |
| | Cocoa int. * log price | -0.0500 | 0.0252 | -0.00403** | 0.0109 | -0.990* |
| | | (0.0634) | (0.0739) | (0.00185) | (0.00716) | (0.546) |
| | Coffee int. * log price | 0.00616 | -0.00886 | 5.37e-05 | -0.00759 | 0.189 |
| | | (0.0138) | (0.0429) | (0.00115) | (0.0153) | (0.148) |
| | Tea int. * log price | -0.319** | 0.171 | -0.0247 | -1.971*** | 0.507 |
| | | (0.148) | (0.686) | (0.0185) | (0.193) | (0.528) |
| | Rubber int. * log price | 0.0148** | -0.00244 | -1.63e-05 | -0.00196* | 0.0275 |
| | | (0.00725) | (0.00850) | (0.000187) | (0.00111) | (0.0181) |
| 2. | Copper int. * log price | -0.000421 | 0.000935*** | -3.49e-06 | 7.99e-05 | -0.00137 |
| | | (0.000293) | (0.000318) | (9.33e-06) | (8.24e-05) | (0.000837) |
| | Coal int. * log price | 3.598* | 3.657 | 0.0418 | 0.108 | 11.18 |
| | | (2.106) | (2.561) | (0.0470) | (0.592) | (8.080) |
| | Gold int. * log price | -4.16e-05 | -1.53e-05 | 4.18e-07 | 8.08e-06* | -9.14e-05 |
| | | (4.18e-05) | (2.77e-05) | (5.21e-07) | (4.30e-06) | (7.47e-05) |
| | Silver int. * log price | -1.31e-05 | 0.000115** | 1.60e-06 | 5.33e-06 | -0.000276* |
| | | (4.08e-05) | (5.54e-05) | (2.13e-06) | (9.68e-06) | (0.000165) |
| | Lead int. * log price | -0.0434 | -0.0398 | 9.81e-05 | -0.00604 | -0.189 |
| | | (0.0468) | (0.0528) | (0.00181) | (0.0332) | (0.200) |
| | Tin int. * log price | -0.00167 | -0.00910*** | 4.37e-05* | 0.00109*** | -0.00147 |
| | | (0.00134) | (0.00111) | (2.59e-05) | (0.000143) | (0.00230) |
| | Zinc int. * log price | 0.00360 | 0.0343*** | 0.000413*** | -0.000123 | 0.00704 |
| | | (0.00260) | (0.00306) | (5.93e-05) | (0.000882) | (0.00693) |
| | Phos int. * log price | 0.00752 | 0.0815*** | 0.000848 | 0.0414*** | -0.0790 |
| | | (0.0122) | (0.0242) | (0.000603) | (0.00466) | (0.0521) |
| Observations | | 2,695 | 2,695 | 2,695 | 2,695 | 2,695 |

*Notes*: (1.) Labour intensive commodities are shown in the magnitude of thousands of hectares and (2.) capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population, HDI, demographic ratios for ages 0-15, 15-64 and 64+, and urbanisation rate. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 17: Regression Results with Respect to Violence without Districts Struck by the 2004 Tsunami

| | | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| | | Deaths | Injuries | Kidnappings | Sex. Assaults | Building Dest. |
| 1. | Palm oil int. * log price | -0.0275*** | 0.0147*** | 5.07e-05 | 0.00274*** | -0.0334** |
| | | (0.00958) | (0.00507) | (0.000161) | (0.000835) | (0.0161) |
| | Coffee int. * log price | 0.0121 | -0.00468 | -6.51e-05 | -0.00508 | 0.192 |
| | | (0.0131) | (0.0438) | (0.000970) | (0.0151) | (0.137) |
| | Cocoa int. * log price | -0.0425 | 0.0523 | -0.00252* | 0.00981 | -0.776* |
| | | (0.0552) | (0.0634) | (0.00145) | (0.00681) | (0.436) |
| | Tea int. * log price | -0.886 | -0.645 | -0.0925 | -5.708*** | 0.577 |
| | | (0.556) | (2.528) | (0.0597) | (0.593) | (2.809) |
| | Rubber int. * log price | 0.0128* | -0.00445 | 3.67e-05 | -0.00225** | 0.0173 |
| | | (0.00658) | (0.00899) | (0.000165) | (0.00111) | (0.0204) |
| 2. | Copper int. * log price | -2.88e-05 | -4.67e-06 | -4.05e-08 | 8.13e-06* | 3.44e-06 |
| | | (3.43e-05) | (3.09e-05) | (4.87e-07) | (4.56e-06) | (9.54e-05) |
| | Coal int. * log price | -1.92e-05 | 0.000106* | 1.28e-06 | -1.62e-06 | -0.000308* |
| | | (4.38e-05) | (5.97e-05) | (2.33e-06) | (9.59e-06) | (0.000184) |
| | Gold int. * log price | -0.000454 | 0.000978*** | -3.29e-06 | 6.73e-05 | -0.00138 |
| | | (0.000300) | (0.000292) | (9.57e-06) | (8.81e-05) | (0.000910) |
| | Silver int. * log price | 7.832** | 12.97*** | 0.132 | -0.0889 | 29.68** |
| | | (3.761) | (4.437) | (0.110) | (0.886) | (12.58) |
| | Lead int. * log price | 0.00714 | 0.00823* | -0.000211 | 0.00988*** | 0.0237 |
| | | (0.00475) | (0.00474) | (0.000153) | (0.000756) | (0.0219) |
| | Tin int. * log price | 0.000419*** | -0.00102*** | 3.20e-05*** | 0.000677*** | -0.000156 |
| | | (9.98e-05) | (0.000214) | (3.87e-06) | (3.27e-05) | (0.000313) |
| | Zinc int. * log price | 0.00345 | 0.0322*** | 0.000407*** | 0.000151 | 0.00386 |
| | | (0.00268) | (0.00279) | (5.73e-05) | (0.000941) | (0.00754) |
| | Phos int. * log price | 0.00593 | 0.0810*** | 0.000858 | 0.0359*** | -0.0749 |
| | | (0.0116) | (0.0246) | (0.000602) | (0.00454) | (0.0505) |
| Observations | | 2,432 | 2,443 | 2,443 | 2,443 | 2,443 |

*Notes*: (1.) Labour intensive commodities are shown in the magnitude of thousands of hectares and (2.) capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population, HDI, demographic ratios for ages 0-15, 15-64 and 64+, and urbanisation rate. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 18: Regression Results with Respect to Violence without Violent Years

| | | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| | | Deaths | Injuries | Kidnappings | Sex. Assaults | Building Dest. |
| 1. | Palm oil int. * log price | 0.000374 | 0.0163*** | -0.000293 | 0.00402*** | -0.000686 |
| | | (0.000527) | (0.00437) | (0.000235) | (0.00109) | (0.00259) |
| | Coffee int. * log price | -0.00494 | -0.0290 | -0.000571 | -0.00106 | 0.0185 |
| | | (0.00371) | (0.0446) | (0.00104) | (0.0131) | (0.0159) |
| | Cocoa int. * log price | -0.00918 | 0.0523 | 0.00191** | 0.0197** | -0.0240 |
| | | (0.0108) | (0.0451) | (0.000949) | (0.00927) | (0.0337) |
| | Tea int. * log price | -1.432*** | -0.876 | -0.0907 | -5.764*** | -2.856 |
| | | (0.553) | (2.511) | (0.0591) | (0.592) | (2.403) |
| | Rubber int. * log price | 0.00127 | -0.00290 | 0.000124 | 0.00131 | 0.00800 |
| | | (0.00100) | (0.00642) | (0.000212) | (0.00221) | (0.00504) |
| 2. | Copper int. * log price | -2.06e-05 | 0.000841*** | -2.38e-05 | 0.000135** | -3.83e-05 |
| | | (2.10e-05) | (0.000228) | (2.35e-05) | (6.45e-05) | (0.000165) |
| | Coal int. * log price | -0.193 | 0.766 | -0.0604 | 0.954 | -2.060 |
| | | (1.026) | (3.222) | (0.142) | (0.820) | (2.943) |
| | Gold int. * log price | 6.68e-06*** | 9.19e-06 | -1.14e-08 | 7.45e-06* | -6.52e-06 |
| | | (2.50e-06) | (1.24e-05) | (5.59e-07) | (4.35e-06) | (8.33e-06) |
| | Silver int. * log price | 3.11e-06 | 0.000118** | 4.54e-06 | -1.19e-05 | 6.01e-05** |
| | | (4.99e-06) | (5.59e-05) | (3.07e-06) | (1.05e-05) | (2.96e-05) |
| | Lead int. * log price | -0.00103 | 0.00585 | -0.000104 | 0.0118*** | 0.00140 |
| | | (0.00104) | (0.00461) | (0.000110) | (0.00245) | (0.00206) |
| | Tin int. * log price | 0.000365*** | -0.000940*** | 3.20e-05*** | 0.000718*** | 0.000291** |
| | | (2.38e-05) | (0.000190) | (4.01e-06) | (3.62e-05) | (0.000143) |
| | Zinc int. * log price | 0.00410*** | 0.0313*** | 0.000389** | 0.000500 | 0.00387*** |
| | | (0.000153) | (0.00183) | (0.000175) | (0.000541) | (0.00147) |
| | Phos int. * log price | 0.0308*** | 0.0819*** | 0.00238 | 0.0422*** | 0.0200 |
| | | (0.00205) | (0.0267) | (0.00165) | (0.00559) | (0.0174) |
| Observations | | 2,465 | 2,465 | 2,465 | 2,465 | 2,465 |

*Notes*: (1.) Labour intensive commodities are shown in the magnitude of thousands of hectares and (2.) capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population, HDI, demographic ratios for ages 0-15, 15-64 and 64+, and urbanisation rate. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 19: Regression Results with Respect to Violence without Violent Districts

| | | (1) Deaths | (2) Injuries | (3) Kidnappings | (4) Sex. Assaults | (5) Building Dest. |
|---|---|---|---|---|---|---|
| 1. | Palm oil int. * log price | -0.0241** | 0.0135** | -4.16e-05 | 0.00248*** | -0.0269 |
| | | (0.0104) | (0.00524) | (0.000157) | (0.000688) | (0.0179) |
| | Coffee int. * log price | 0.00942 | -0.0103 | 2.87e-05 | -0.000853 | 0.185 |
| | | (0.0126) | (0.0465) | (0.000969) | (0.0134) | (0.129) |
| | Cocoa int. * log price | -0.0387 | 0.0297 | -0.00266* | 0.00998 | -0.764* |
| | | (0.0551) | (0.0640) | (0.00142) | (0.00697) | (0.429) |
| | Tea int. * log price | -0.899* | -0.427 | -0.0928 | -5.700*** | 0.622 |
| | | (0.545) | (2.461) | (0.0591) | (0.595) | (2.771) |
| | Rubber int. * log price | 0.0129* | -0.00580 | 6.39e-06 | -0.00173 | 0.0182 |
| | | (0.00693) | (0.00961) | (0.000173) | (0.00107) | (0.0217) |
| 2. | Copper int. * log price | -0.000498 | 0.000788*** | -2.66e-06 | 6.57e-05 | -0.00149 |
| | | (0.000335) | (0.000270) | (9.26e-06) | (0.000105) | (0.000997) |
| | Coal int. * log price | 8.661** | 11.63*** | 0.144 | -0.183 | 32.01** |
| | | (3.865) | (4.336) | (0.117) | (0.804) | (13.23) |
| | Gold int. * log price | -3.46e-05 | -1.60e-05 | 3.03e-07 | 8.64e-06** | -1.12e-05 |
| | | (3.75e-05) | (3.33e-05) | (5.03e-07) | (4.24e-06) | (9.70e-05) |
| | Silver int. * log price | 1.65e-05 | 0.000139** | 2.02e-06 | 8.14e-06 | -0.000202 |
| | | (4.63e-05) | (5.53e-05) | (2.23e-06) | (9.85e-06) | (0.000171) |
| | Lead int. * log price | 0.00525 | 0.00924* | -0.000170 | 0.0113*** | 0.0220 |
| | | (0.00467) | (0.00492) | (0.000148) | (0.00189) | (0.0203) |
| | Tin int. * log price | 0.000402*** | -0.00102*** | 3.12e-05*** | 0.000684*** | -0.000208 |
| | | (9.83e-05) | (0.000210) | (4.00e-06) | (3.15e-05) | (0.000311) |
| | Zinc int. * log price | 0.00337 | 0.0334*** | 0.000378*** | 3.92e-05 | 0.00392 |
| | | (0.00310) | (0.00251) | (5.60e-05) | (0.00114) | (0.00812) |
| | Phos int. * log price | 0.00490 | 0.0719*** | 0.000663 | 0.0392*** | -0.0855* |
| | | (0.0110) | (0.0238) | (0.000641) | (0.00441) | (0.0500) |
| Observations | | 2,603 | 2,603 | 2,603 | 2,603 | 2,603 |

*Notes*: (1.) Labour intensive commodities are shown in the magnitude of thousands of hectares and (2.) capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population, HDI, demographic ratios for ages 0-15, 15-64 and 64+, and urbanisation rate. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 20: Regression Results with Respect to Violence without New or Split Districts

| | | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| | | Deaths | Injuries | Kidnappings | Sex. Assaults | Building Dest. |
| 1. | Palm oil int. * log price | -0.0184* | 0.0157 | -0.00206** | 0.00579 | -0.0314 |
| | | (0.0111) | (0.0178) | (0.00100) | (0.00494) | (0.0470) |
| | Coffee int. * log price | 0.0156 | -0.00955 | 0.000247 | 0.00521 | 0.0417 |
| | | (0.00963) | (0.0480) | (0.000572) | (0.0125) | (0.0308) |
| | Cocoa int. * log price | 0.179** | 0.151 | 0.000383 | 0.0258 | -0.00917 |
| | | (0.0862) | (0.121) | (0.00380) | (0.0162) | (0.180) |
| | Tea int. * log price | -1.234 | 2.477 | -0.154*** | -5.519*** | -3.754 |
| | | (0.796) | (2.154) | (0.0516) | (0.922) | (3.965) |
| | Rubber int. * log price | 0.000501 | -0.0142 | -0.000134 | -0.00383 | -0.0207 |
| | | (0.0144) | (0.0196) | (0.000494) | (0.00372) | (0.0516) |
| 2. | Copper int. * log price | -0.000965 | 0.00365** | -1.18e-05 | 1.13e-05 | -0.000241 |
| | | (0.000946) | (0.00151) | (4.73e-05) | (0.000188) | (0.00116) |
| | Coal int. * log price | 12.70** | 7.575 | -0.0770 | 2.413 | 21.62 |
| | | (6.331) | (14.54) | (0.254) | (2.365) | (27.21) |
| | Gold int. * log price | -0.000607 | -0.00421 | -3.18e-05 | -0.000592* | 0.000304 |
| | | (0.000997) | (0.00262) | (5.44e-05) | (0.000316) | (0.00249) |
| | Silver int. * log price | 0.0151 | 0.0341 | 0.000447 | -0.000431 | -0.00861 |
| | | (0.0108) | (0.0236) | (0.000617) | (0.00284) | (0.0165) |
| | Lead int. * log price | -0.940** | 0.122 | 0.0213* | 0.233*** | 0.419 |
| | | (0.426) | (0.603) | (0.0118) | (0.0882) | (0.364) |
| | Tin int. * log price | 0.000235 | -0.00110*** | 4.08e-05*** | 0.000633*** | 0.000237 |
| | | (0.000172) | (0.000345) | (7.83e-06) | (6.06e-05) | (0.000550) |
| | Zinc int. * log price | 0.00994* | 0.0139 | 0.000412 | 0.000969 | 0.00678 |
| | | (0.00552) | (0.00967) | (0.000305) | (0.00118) | (0.00659) |
| | Phos int. * log price | 0.0193* | 0.0926** | 0.00113 | 0.0428*** | 0.0422 |
| | | (0.0111) | (0.0361) | (0.00102) | (0.00710) | (0.0316) |
| Observations | | 1,515 | 1,515 | 1,515 | 1,515 | 1,515 |

*Notes*: (1.) Labour intensive commodities are shown in the magnitude of thousands of hectares and (2.) capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population, HDI, demographic ratios for ages 0-15, 15-64 and 64+, and urbanisation rate. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 21: Regression Results with Respect to Violence without Trended Control Variables

| | | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| | | Deaths | Injuries | Kidnappings | Sex. Assaults | Building Dest. |
| 1. | Palm oil int. * log price | -0.0216** | 0.00903 | -0.00173 | 0.00188*** | -0.0200 |
| | | (0.00859) | (0.00587) | (0.00170) | (0.000571) | (0.0152) |
| | Coffee int. * log price | 0.0103 | 0.0131 | 0.00240 | -0.00150 | 0.0997 |
| | | (0.0125) | (0.0292) | (0.00229) | (0.00808) | (0.0817) |
| | Cocoa int. * log price | -0.0446 | -0.00890 | -0.00540 | 0.00606 | -0.679 |
| | | (0.0522) | (0.0552) | (0.00599) | (0.00575) | (0.437) |
| | Tea int. * log price | -1.347** | -1.419 | -0.0824 | -5.822*** | -0.935 |
| | | (0.562) | (2.449) | (0.0610) | (0.557) | (2.548) |
| | Rubber int. * log price | 0.0140** | -0.00846 | 0.00147* | -0.00245** | 0.0154 |
| | | (0.00611) | (0.00944) | (0.000875) | (0.00104) | (0.0191) |
| 2. | Copper int. * log price | -2.91e-05 | 0.000422 | -2.20e-05 | 1.88e-05 | -0.000269 |
| | | (0.000229) | (0.000284) | (9.04e-05) | (5.88e-05) | (0.000443) |
| | Coal int. * log price | 10.26** | 10.75** | 0.985 | -0.0590 | 30.05** |
| | | (4.053) | (4.240) | (0.886) | (0.940) | (14.81) |
| | Gold int. * log price | 2.89e-06 | -9.25e-06 | 5.38e-06* | 2.11e-06 | 5.82e-06 |
| | | (1.52e-05) | (1.06e-05) | (3.13e-06) | (3.60e-06) | (4.43e-05) |
| | Silver int. * log price | 2.46e-05 | 8.07e-06 | 2.53e-06 | -1.98e-06 | -0.000184 |
| | | (9.13e-05) | (6.53e-05) | (2.76e-05) | (1.20e-05) | (0.000191) |
| | Lead int. * log price | 0.00673 | 0.0104** | 0.00193 | 0.0113*** | 0.0180 |
| | | (0.00520) | (0.00479) | (0.00252) | (0.00142) | (0.0190) |
| | Tin int. * log price | 0.000495*** | -0.000951*** | 4.62e-05*** | 0.000690*** | -7.25e-05 |
| | | (6.56e-05) | (0.000136) | (1.08e-05) | (2.12e-05) | (0.000239) |
| | Zinc int. * log price | 0.00459* | 0.0369*** | 0.00140 | 0.000453 | -0.00229 |
| | | (0.00237) | (0.00253) | (0.000955) | (0.000606) | (0.00666) |
| | Phos int. * log price | 0.0196*** | 0.0522*** | -0.000574 | 0.0311*** | -0.0381 |
| | | (0.00718) | (0.0144) | (0.00104) | (0.00306) | (0.0326) |
| Observations | | 3,529 | 3,529 | 3,529 | 3,529 | 3,529 |

*Notes*: (1.) Labour intensive commodities are shown in the magnitude of thousands of hectares and (2.) capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect and log of population. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 22: Summary of Regression Results with Respect to Ownership Structure in USD

| | (1) Deaths | (2) Injuries | (3) Kidnappings | (4) Sex. Assaults | (5) Building Dest. |
|---|---|---|---|---|---|
| Private Est. int. * log price | -0.0396*** | 0.0103* | -6.02e-05 | 0.00253*** | -0.0471** |
| | (0.0140) | (0.00548) | (0.000223) | (0.000961) | (0.0197) |
| Small Holder Est. int. * log price | 0.0154 | 0.0280 | 0.000548 | 0.00416 | 0.0994 |
| | (0.0358) | (0.0301) | (0.00104) | (0.00447) | (0.0827) |
| Government Est. int. * log price | 0.0267 | 0.0337 | -0.000954 | -0.00407 | 0.0553 |
| | (0.0426) | (0.0249) | (0.00125) | (0.00610) | (0.0961) |
| Observations | 2,695 | 2,695 | 2,695 | 2,695 | 2,695 |

*Notes*: Palm oil production intensity is shown in the magnitude of thousands of hectares. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population, HDI, demographic ratios for ages 0-15, 15-64 and 64+, urbanisation rate and production or reserve intensity times log price for the other commodities. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 23: Summary of Regression Results with Respect to Ownership Structure without Districts Struck by the 2004 Tsunami

| | (1) Deaths | (2) Injuries | (3) Kidnappings | (4) Sex. Assaults | (5) Building Dest. |
|---|---|---|---|---|---|
| Private Est. int. * log price | -0.0372*** | 0.0132** | -0.000142 | 0.00159 | -0.0461** |
| | (0.0123) | (0.00656) | (0.000274) | (0.00126) | (0.0213) |
| Small Holder Est. int. * log price | 0.0504 | 0.0384 | 0.00140 | 0.0114 | 0.127 |
| | (0.0389) | (0.0422) | (0.00129) | (0.00840) | (0.120) |
| Government Est. int. * log price | -0.167*** | -0.109* | -0.000928 | -0.00918 | -0.741*** |
| | (0.0640) | (0.0605) | (0.00182) | (0.0121) | (0.259) |
| Observations | 2,443 | 2,443 | 2,443 | 2,443 | 2,443 |

*Notes*: Palm oil production intensity is shown in the magnitude of thousands of hectares. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population, HDI, demographic ratios for ages 0-15, 15-64 and 64+, urbanisation rate and production or reserve intensity times log price for the other commodities. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 24: Summary of Regression Results with Respect to Ownership Structure without Violent Years

| | (1)<br>Deaths | (2)<br>Injuries | (3)<br>Kidnappings | (4)<br>Sex. Assaults | (5)<br>Building Dest. |
|---|---|---|---|---|---|
| Private Est. int. * log price | 0.00123** | 0.0108** | -0.000281 | 0.00373*** | 0.00289 |
| | (0.000499) | (0.00470) | (0.000338) | (0.00133) | (0.00207) |
| Small Holder Est. int. * log price | 0.000608 | 0.0455 | 0.000352 | 0.0124* | -0.0231 |
| | (0.00411) | (0.0281) | (0.00118) | (0.00640) | (0.0166) |
| Government Est. int. * log price | -0.00751** | 0.0188 | -0.00142 | -0.00662 | 0.00334 |
| | (0.00331) | (0.0240) | (0.00138) | (0.00826) | (0.00984) |
| Observations | 2,465 | 2,465 | 2,465 | 2,465 | 2,465 |

*Notes*: Palm oil production intensity is shown in the magnitude of thousands of hectares. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population, HDI, demographic ratios for ages 0-15, 15-64 and 64+, urbanisation rate and production or reserve intensity times log price for the other commodities. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 25: Summary of Regression Results with Respect to Ownership Structure without Violent Districts

| | (1)<br>Deaths | (2)<br>Injuries | (3)<br>Kidnappings | (4)<br>Sex. Assaults | (5)<br>Building Dest. |
|---|---|---|---|---|---|
| Private Est. int. * log price | -0.0278** | 0.0177*** | -7.39e-05 | 0.00274*** | -0.0121 |
| | (0.0133) | (0.00635) | (0.000223) | (0.000960) | (0.0277) |
| Small Holder Est. int. * log price | -0.00854 | -0.0167 | 0.000560 | 0.00391 | -0.0938 |
| | (0.0441) | (0.0291) | (0.000880) | (0.00514) | (0.151) |
| Government Est. int. * log price | -0.0118 | 0.0281 | -0.00102 | -0.00438 | -0.0650 |
| | (0.0508) | (0.0262) | (0.00108) | (0.00676) | (0.162) |
| Observations | 2,603 | 2,603 | 2,603 | 2,603 | 2,603 |

*Notes*: Palm oil production intensity is shown in the magnitude of thousands of hectares. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population, HDI, demographic ratios for ages 0-15, 15-64 and 64+, urbanisation rate and production or reserve intensity times log price for the other commodities. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 26: Summary of Regression Results with Respect to Ownership Structure without New or Split Districts

| | (1) Deaths | (2) Injuries | (3) Kidnappings | (4) Sex. Assaults | (5) Building Dest. |
|---|---|---|---|---|---|
| Private Est. int. * log price | -0.0425 | -0.142 | 4.44e-05 | -0.0169 | -0.425** |
| | (0.0537) | (0.123) | (0.00859) | (0.0187) | (0.198) |
| Small Holder Est. int. * log price | 0.0471 | 0.253 | -0.00258 | 0.0475* | 0.144 |
| | (0.113) | (0.244) | (0.00737) | (0.0263) | (0.227) |
| Government Est. int. * log price | -0.0497 | -0.0561 | -0.00296 | -0.00980 | 0.0797 |
| | (0.0451) | (0.0957) | (0.00280) | (0.0151) | (0.106) |
| Observations | 1,515 | 1,515 | 1,515 | 1,515 | 1,515 |

*Notes*: Palm oil production intensity is shown in the magnitude of thousands of hectares. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population, HDI, demographic ratios for ages 0-15, 15-64 and 64+, urbanisation rate and production or reserve intensity times log price for the other commodities. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 27: Summary of Regression Results with Respect to Ownership Structure without Trended Control Variables

| | (1) Deaths | (2) Injuries | (3) Kidnappings | (4) Sex. Assaults | (5) Building Dest. |
|---|---|---|---|---|---|
| Private Est. int. * log price | -0.0154** | 0.0202*** | 0.00341* | 0.00144* | -0.00869 |
| | (0.0063) | (0.00697) | (0.00192) | (0.000763) | (0.0218) |
| Small Holder Est. int. * log price | -0.0597 | -0.0488 | -0.0303* | 0.00799 | -0.0794 |
| | (0.0608) | (0.0437) | (0.0173) | (0.00513) | (0.126) |
| Government Est. int. * log price | -0.0120 | 0.000342 | -0.00104 | -0.00676 | -0.0264 |
| | (0.0631) | (0.0497) | (0.0144) | (0.00629) | (0.145) |
| Observations | 3,583 | 3,583 | 3,583 | 3,583 | 3,583 |

*Notes*: Palm oil production intensity is shown in the magnitude of thousands of hectares. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population, and production or reserve intensity times log price for the other commodities. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 28: Summary of Regression Results with Respect to Channels in USD

| | | (1) | (2) | (3) |
|---|---|---|---|---|
| | | Opportunity Cost Effect | | |
| | | Household expenditure p.c. (log) | Personnel expenditure. p.c. (log) | Employment rate |
| 1. | Palm oil int. * log price | 2.14e-05 | 0.000303 | 0.000104*** |
| | | (9.82e-05) | (0.000222) | (3.65e-05) |
| | Coffee int. * log price | 0.000725** | 0.000448 | -0.000174 |
| | | (0.000343) | (0.000838) | (0.000283) |
| | Cocoa int. * log price | 0.000444 | -0.000421 | 3.00e-05 |
| | | (0.000719) | (0.00167) | (0.000210) |
| | Tea int. * log price | -0.0863*** | -0.0499*** | 0.00940*** |
| | | (0.0186) | (0.0159) | (0.00233) |
| | Rubber int. * log price | 0.000779*** | 0.000228 | -7.56e-05*** |
| | | (0.000146) | (0.000209) | (2.62e-05) |
| 2. | Copper int. * log price | 1.99e-06** | -1.82e-06 | 5.58e-07 |
| | | (9.89e-07) | (4.62e-06) | (4.08e-06) |
| | Coal int. * log price | 0.0163 | 0.0755** | 0.00494** |
| | | (0.0105) | (0.0373) | (0.00221) |
| | Gold int. * log price | 2.17e-06*** | 1.10e-07 | 6.61e-08 |
| | | (6.85e-07) | (1.39e-06) | (8.94e-08) |
| | Silver int. * log price | 3.12e-05*** | 1.08e-05*** | -2.02e-06*** |
| | | (1.22e-06) | (2.09e-06) | (2.85e-07) |
| | Lead int. * log price | -6.08e-05*** | -2.85e-05 | -1.03e-07 |
| | | (1.91e-05) | (3.78e-05) | (7.16e-06) |
| | Tin int. * log price | -1.31e-06 | 4.80e-06 | -2.72e-06*** |
| | | (2.76e-06) | (1.35e-05) | (9.00e-07) |
| | Zinc int. * log price | 0.000150*** | 0.00115*** | -8.53e-05*** |
| | | (3.04e-05) | (9.23e-05) | (1.37e-05) |
| | Phos. int. * log price | -0.00664*** | 0.00305*** | -0.000676*** |
| | | (0.000584) | (0.000697) | (4.27e-05) |
| Observations | | 5,747 | 4,716 | 3,112 |

*Notes*: (1.) Labour intensive commodities are shown in the magnitude of thousands of hectares and (2.) capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population for (3), HDI, demographic ratios for ages 0-15, 15-64 and 64+, and urbanisation rate. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 29: Summary of Regression Results with Respect to Channels in USD

| | | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| | | Rapacity Effect | | | State Capacity | |
| | | Tax Sharing (log) | Natural Res. Shar. (log) | Own rev. (log) | Law. Exp. (log) | Cap. Exp. (log) |
| 1. | Palm oil int. * log price | -0.000139 | -0.00340*** | -0.000681* | 0.000100 | -0.00141*** |
| | | (0.000426) | (0.00102) | (0.000365) | (0.00153) | (0.000393) |
| | Coffee int. * log price | -0.000738 | -0.00316 | 0.00244*** | -0.00131 | 0.00132 |
| | | (0.00151) | (0.00443) | (0.000795) | (0.00482) | (0.00189) |
| | Cocoa int. * log price | 0.00464 | -0.0175 | -0.00143 | 0.00607 | 0.00405 |
| | | (0.00371) | (0.0128) | (0.00223) | (0.00938) | (0.00332) |
| | Tea int. * log price | 0.00856 | 0.0831 | -0.0437 | -0.259* | -0.0102 |
| | | (0.0462) | (0.122) | (0.0973) | (0.152) | (0.0329) |
| | Rubber int. * log price | 0.00117** | 0.00453*** | 0.00121** | 0.00147 | 0.00141*** |
| | | (0.000467) | (0.00169) | (0.000587) | (0.00167) | (0.000512) |
| 2. | Copper int. * log price | -2.40e-05*** | -7.84e-05*** | 9.64e-07 | -2.03e-05 | -1.89e-05** |
| | | (2.09e-06) | (2.18e-05) | (1.09e-05) | (2.22e-05) | (8.00e-06) |
| | Coal int. * log price | 0.192* | 0.494* | 0.263*** | 0.0491 | 0.00746 |
| | | (0.105) | (0.282) | (0.0671) | (0.192) | (0.0502) |
| | Gold int. * log price | -2.45e-06 | -1.10e-05 | -6.93e-06** | -8.83e-06 | -2.92e-06 |
| | | (2.73e-06) | (8.68e-06) | (2.91e-06) | (6.32e-06) | (2.11e-06) |
| | Silver int. * log price | 4.23e-05*** | -0.000115*** | 0.000110*** | 3.71e-05*** | 3.81e-05*** |
| | | (2.85e-06) | (1.04e-05) | (5.26e-06) | (1.08e-05) | (3.33e-06) |
| | Lead int. * log price | -5.23e-05 | 0.000354* | -0.000105*** | 0.000575*** | 0.000211** |
| | | (4.04e-05) | (0.000197) | (1.80e-05) | (0.000100) | (8.22e-05) |
| | Tin int. * log price | -1.44e-06 | 9.91e-05** | 1.52e-05 | 6.71e-05* | -3.18e-05* |
| | | (1.19e-05) | (4.96e-05) | (2.59e-05) | (3.57e-05) | (1.72e-05) |
| | Zinc int. * log price | 0.00177*** | 0.000871 | 0.000694*** | 4.29e-05 | 0.000658*** |
| | | (7.15e-05) | (0.000644) | (0.000146) | (0.000321) | (0.000142) |
| | Phos. int. * log price | 0.0112*** | 0.0782*** | 0.00792*** | 0.00695** | 0.00740*** |
| | | (0.00134) | (0.00434) | (0.00117) | (0.00306) | (0.00146) |
| Observations | | 5,172 | 4,919 | 5,911 | 3,241 | 4,693 |

*Notes*: (1.) Labour intensive commodities are shown in the magnitude of thousands of hectares and (2.) capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population, HDI, demographic ratios for ages 0-15, 15-64 and 64+, and urbanisation rate. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 30: Summary of Regression Results with Respect to Channels without Districts Struck by the 2004 Tsunami

| | | (1) | (2) | (3) |
|---|---|---|---|---|
| | | Opportunity Cost Effect | | |
| | | Household expenditure p.c. (log) | Personnel expenditure. p.c. (log) | Employment rate |
| 1. | Palm oil int. * log price | -3.68e-05 | 0.000262 | 5.37e-05 |
| | | (9.88e-05) | (0.000244) | (5.13e-05) |
| | Coffee int. * log price | 0.000509* | 0.000330 | -0.000255 |
| | | (0.000302) | (0.000793) | (0.000285) |
| | Cocoa int. * log price | 0.000268 | -0.000278 | 4.29e-05 |
| | | (0.000533) | (0.00171) | (0.000196) |
| | Tea int. * log price | -0.0568*** | -0.0454*** | 0.00654* |
| | | (0.0149) | (0.0154) | (0.00368) |
| | Rubber int. * log price | 0.000644*** | 0.000265 | -0.000115*** |
| | | (0.000143) | (0.000225) | (3.29e-05) |
| 2. | Copper int. * log price | 2.05e-06** | -1.42e-06 | 3.88e-07 |
| | | (8.34e-07) | (4.01e-06) | (3.99e-06) |
| | Coal int. * log price | 0.0116 | 0.0744* | 0.00986** |
| | | (0.0122) | (0.0390) | (0.00402) |
| | Gold int. * log price | 2.24e-06*** | -2.01e-07 | 1.88e-09 |
| | | (8.00e-07) | (1.51e-06) | (1.29e-07) |
| | Silver int. * log price | 3.20e-05*** | 1.06e-05*** | -2.88e-06*** |
| | | (1.32e-06) | (1.70e-06) | (3.32e-07) |
| | Lead int. * log price | -5.91e-05*** | -2.50e-05 | 1.62e-05*** |
| | | (1.57e-05) | (3.43e-05) | (5.05e-06) |
| | Tin int. * log price | -5.89e-07 | 5.16e-06 | -3.47e-06 |
| | | (2.58e-06) | (1.31e-05) | (2.11e-06) |
| | Zinc int. * log price | 9.92e-05*** | 0.00124*** | -5.97e-05*** |
| | | (3.35e-05) | (7.22e-05) | (1.13e-05) |
| | Phos. int. * log price | -0.00439*** | 0.00244*** | -0.000640*** |
| | | (0.000479) | (0.000667) | (4.32e-05) |
| Observations | | 5,380 | 4,415 | 2,904 |

*Notes*: (1.) Labour intensive commodities are shown in the magnitude of thousands of hectares and (2.) capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population for (3), HDI, demographic ratios for ages 0-15, 15-64 and 64+, and urbanisation rate. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 31: Summary of Regression Results with Respect to Channels without Districts Struck by the 2004 Tsunami

| | | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| | | Rapacity Effect | | | State Capacity | |
| | | Tax Sharing (log) | Natural Res. Shar. (log) | Own rev. (log) | Law. Exp. (log) | Cap. Exp. (log) |
| 1. | Palm oil int. * log price | -8.30e-05 | -0.000376 | 3.63e-05 | 0.000785 | -0.00140*** |
| | | (0.000512) | (0.00122) | (0.000350) | (0.00198) | (0.000466) |
| | Coffee int. * log price | -0.000423 | 0.00193 | 0.00242*** | -0.00171 | 0.00135 |
| | | (0.00133) | (0.00308) | (0.000767) | (0.00481) | (0.00172) |
| | Cocoa int. * log price | 0.00216 | -0.0208** | -0.00147 | 0.00593 | 0.00227 |
| | | (0.00230) | (0.00952) | (0.00171) | (0.00897) | (0.00295) |
| | Tea int. * log price | 0.000610 | 0.306*** | -0.0455 | -0.260* | 0.0106 |
| | | (0.0227) | (0.104) | (0.0554) | (0.143) | (0.0320) |
| | Rubber int. * log price | 0.000880* | 0.00395** | 0.00104* | 0.00162 | 0.00158*** |
| | | (0.000459) | (0.00163) | (0.000557) | (0.00181) | (0.000531) |
| 2. | Copper int. * log price | -1.92e-05*** | -7.08e-05*** | 1.03e-06 | -2.10e-05 | -1.88e-05** |
| | | (2.80e-06) | (1.20e-05) | (8.69e-06) | (2.40e-05) | (7.36e-06) |
| | Coal int. * log price | 0.166* | 0.503* | 0.200*** | 0.0384 | 0.00341 |
| | | (0.0853) | (0.276) | (0.0659) | (0.191) | (0.0528) |
| | Gold int. * log price | -5.22e-06 | -2.53e-05* | -4.79e-06 | -9.63e-06 | -2.92e-06 |
| | | (3.94e-06) | (1.40e-05) | (2.98e-06) | (6.94e-06) | (2.29e-06) |
| | Silver int. * log price | 4.68e-05*** | -0.000114*** | 0.000103*** | 4.86e-05*** | 3.74e-05*** |
| | | (2.82e-06) | (1.16e-05) | (2.58e-06) | (8.39e-06) | (3.46e-06) |
| | Lead int. * log price | -5.48e-05* | 0.000483*** | -9.85e-05*** | 0.000631*** | 0.000210** |
| | | (2.94e-05) | (0.000166) | (1.74e-05) | (0.000107) | (8.21e-05) |
| | Tin int. * log price | -2.45e-06 | 7.49e-05* | 5.95e-06 | 5.88e-05 | -3.16e-05* |
| | | (1.12e-05) | (4.06e-05) | (1.76e-05) | (3.86e-05) | (1.76e-05) |
| | Zinc int. * log price | 0.00169*** | 0.00131*** | 0.000561*** | 0.000292 | 0.000492*** |
| | | (7.73e-05) | (0.000339) | (0.000134) | (0.000339) | (0.000138) |
| | Phos. int. * log price | 0.00880*** | 0.0676*** | 0.00732*** | 0.00705** | 0.00687*** |
| | | (0.00110) | (0.00371) | (0.000966) | (0.00311) | (0.00143) |
| Observations | | 4,834 | 4,596 | 5,532 | 3,014 | 4,394 |

*Notes*: (1.) Labour intensive commodities are shown in the magnitude of thousands of hectares and (2.) capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population, HDI, demographic ratios for ages 0-15, 15-64 and 64+, and urbanisation rate. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 32: Summary of Regression Results with Respect to Channels without Violent Years

| | | (1) | (2) | (3) |
|---|---|---|---|---|
| | | Opportunity Cost Effect | | |
| | | Household expenditure p.c. (log) | Personnel expenditure. p.c. (log) | Employment rate |
| 1. | Palm oil int. * log price | -5.08e-05 | 0.000322 | 6.95e-05 |
| | | (0.000120) | (0.000244) | (4.70e-05) |
| | Coffee int. * log price | 0.00135*** | -1.41e-05 | -0.000303 |
| | | (0.000432) | (0.00105) | (0.000293) |
| | Cocoa int. * log price | 0.00140 | -0.00157 | 2.36e-05 |
| | | (0.000863) | (0.00195) | (0.000199) |
| | Tea int. * log price | -0.0660*** | -0.0548*** | 0.00582 |
| | | (0.0171) | (0.0173) | (0.00354) |
| | Rubber int. * log price | 0.00139*** | 0.000262 | -0.000109*** |
| | | (0.000244) | (0.000358) | (3.28e-05) |
| 2. | Copper int. * log price | 7.14e-06*** | -6.27e-06 | 3.38e-07 |
| | | (1.72e-06) | (4.54e-06) | (4.03e-06) |
| | Coal int. * log price | -0.00283 | 0.00720 | 0.00933** |
| | | (0.0149) | (0.0676) | (0.00412) |
| | Gold int. * log price | 2.60e-06*** | 2.42e-07 | -2.20e-08 |
| | | (6.13e-07) | (1.03e-06) | (1.34e-07) |
| | Silver int. * log price | 3.20e-05*** | 1.17e-05*** | -2.79e-06*** |
| | | (1.40e-06) | (2.40e-06) | (3.16e-07) |
| | Lead int. * log price | -6.35e-05*** | -4.98e-05** | 1.51e-05*** |
| | | (2.21e-05) | (2.28e-05) | (4.99e-06) |
| | Tin int. * log price | -2.74e-06 | -2.61e-06 | -3.82e-06* |
| | | (2.26e-06) | (1.23e-05) | (2.07e-06) |
| | Zinc int. * log price | -1.29e-05 | 0.00178*** | -5.76e-05*** |
| | | (3.30e-05) | (0.000118) | (1.13e-05) |
| | Phos. int. * log price | -0.00715*** | 0.00145* | -0.000647*** |
| | | (0.000584) | (0.000840) | (4.17e-05) |
| Observations | | 4,116 | 4,133 | 3,112 |

*Notes*: (1.) Labour intensive commodities are shown in the magnitude of thousands of hectares and (2.) capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population for (3), HDI, demographic ratios for ages 0-15, 15-64 and 64+, and urbanisation rate. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 33: Summary of Regression Results with Respect to Channels without Violent Years

| | | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| | | Rapacity Effect | | | State Capacity | |
| | | Tax Sharing (log) | Natural Res. Shar. (log) | Own rev. (log) | Law. Exp. (log) | Cap. Exp. (log) |
| 1. | Palm oil int. * log price | -0.000554 | -0.00286*** | -0.00130*** | -0.000201 | -0.00105** |
| | | (0.000411) | (0.000977) | (0.000371) | (0.00147) | (0.000443) |
| | Coffee int. * log price | 0.000554 | -0.00106 | 0.00100 | -0.00207 | 0.00199* |
| | | (0.00141) | (0.00510) | (0.00168) | (0.00276) | (0.00118) |
| | Cocoa int. * log price | -0.00151 | -0.0241** | -0.000839 | 0.00482 | -0.00274 |
| | | (0.00260) | (0.00960) | (0.00311) | (0.00946) | (0.00267) |
| | Tea int. * log price | -0.0144 | 0.0767 | -0.0356 | -0.207*** | -0.0125 |
| | | (0.0313) | (0.0879) | (0.0648) | (0.0777) | (0.0386) |
| | Rubber int. * log price | 0.00178*** | 0.00337** | 0.00179** | 0.00328** | 0.00148*** |
| | | (0.000603) | (0.00147) | (0.000792) | (0.00133) | (0.000493) |
| 2. | Copper int. * log price | -3.37e-05*** | -6.30e-05 | -1.15e-05** | 8.84e-06 | -1.77e-05*** |
| | | (5.83e-06) | (5.86e-05) | (4.46e-06) | (2.21e-05) | (4.26e-06) |
| | Coal int. * log price | -0.142 | 0.0626 | 0.0775 | -0.332* | 0.00359 |
| | | (0.107) | (0.124) | (0.0670) | (0.196) | (0.0576) |
| | Gold int. * log price | -7.21e-07 | -1.47e-05 | -3.24e-06 | -6.02e-06** | -5.79e-06*** |
| | | (1.29e-06) | (9.05e-06) | (3.88e-06) | (2.60e-06) | (2.05e-06) |
| | Silver int. * log price | 4.46e-05*** | -0.000121*** | 0.000110*** | 5.75e-05*** | 3.93e-05*** |
| | | (3.35e-06) | (9.23e-06) | (4.15e-06) | (7.34e-06) | (3.58e-06) |
| | Lead int. * log price | -3.43e-05 | -0.000175*** | -0.000126*** | 0.000536 | 0.000345*** |
| | | (3.99e-05) | (5.97e-05) | (3.02e-05) | (0.000336) | (8.55e-05) |
| | Tin int. * log price | -1.69e-05 | 1.40e-05 | -1.09e-05 | 4.22e-05* | -3.78e-05*** |
| | | (1.19e-05) | (1.92e-05) | (1.90e-05) | (2.34e-05) | (8.82e-06) |
| | Zinc int. * log price | 0.00187*** | 0.00182** | 0.000628*** | 0.00114*** | 0.000371*** |
| | | (8.87e-05) | (0.000708) | (8.68e-05) | (0.000297) | (0.000102) |
| | Phos. int. * log price | 0.00273** | 0.0493*** | -0.00272 | -0.00575* | 0.00583*** |
| | | (0.00114) | (0.00370) | (0.00181) | (0.00311) | (0.00145) |
| Observations | | 3,569 | 3,359 | 4,307 | 2,687 | 4,117 |

*Notes*: (1.) Labour intensive commodities are shown in the magnitude of thousands of hectares and (2.) capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population, HDI, demographic ratios for ages 0-15, 15-64 and 64+, and urbanisation rate. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 34: Summary of Regression Results with Respect to Channels without Violent Districts

| | | (1) | (2) | (3) |
|---|---|---|---|---|
| | | Opportunity Cost Effect | | |
| | | Household expenditure p.c. (log) | Personnel expenditure. p.c. (log) | Employment rate |
| 1. | Palm oil int. * log price | -1.26e-05 | 0.000308 | 7.01e-05 |
| | | (8.63e-05) | (0.000218) | (4.72e-05) |
| | Coffee int. * log price | 0.000721** | 0.000384 | -0.000287 |
| | | (0.000284) | (0.000802) | (0.000291) |
| | Cocoa int. * log price | 0.000356 | -0.000432 | 2.80e-05 |
| | | (0.000545) | (0.00171) | (0.000200) |
| | Tea int. * log price | -0.0562*** | -0.0455*** | 0.00566 |
| | | (0.0147) | (0.0156) | (0.00349) |
| | Rubber int. * log price | 0.000636*** | 0.000247 | -0.000112*** |
| | | (0.000139) | (0.000224) | (3.29e-05) |
| 2. | Copper int. * log price | 2.22e-06*** | -2.09e-06 | 4.45e-07 |
| | | (8.14e-07) | (4.10e-06) | (4.10e-06) |
| | Coal int. * log price | 0.0117 | 0.0702* | 0.00917** |
| | | (0.0118) | (0.0385) | (0.00408) |
| | Gold int. * log price | 2.30e-06*** | -3.89e-07 | -1.98e-08 |
| | | (7.97e-07) | (1.56e-06) | (1.33e-07) |
| | Silver int. * log price | 3.23e-05*** | 1.08e-05*** | -2.67e-06*** |
| | | (1.30e-06) | (2.22e-06) | (3.04e-07) |
| | Lead int. * log price | -5.76e-05*** | -2.60e-05 | 1.57e-05*** |
| | | (1.52e-05) | (3.51e-05) | (5.02e-06) |
| | Tin int. * log price | -6.02e-07 | 4.35e-06 | -3.97e-06* |
| | | (2.53e-06) | (1.28e-05) | (2.06e-06) |
| | Zinc int. * log price | 0.000112*** | 0.00128*** | -5.59e-05*** |
| | | (3.30e-05) | (9.16e-05) | (1.18e-05) |
| | Phos. int. * log price | -0.00424*** | 0.00256*** | -0.000646*** |
| | | (0.000455) | (0.000689) | (4.15e-05) |
| Observations | | 5,661 | 4,636 | 3,047 |

*Notes*: (1.) Labour intensive commodities are shown in the magnitude of thousands of hectares and (2.) capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population for (3), HDI, demographic ratios for ages 0-15, 15-64 and 64+, and urbanisation rate. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 35: Summary of Regression Results with Respect to Channels without Violent Districts

| | | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| | | Rapacity Effect | | | State Capacity | |
| | | Tax Sharing (log) | Natural Res. Shar. (log) | Own rev. (log) | Law. Exp. (log) | Cap. Exp. (log) |
| 1. | Palm oil int. * log price | -0.000311 | -0.00151 | -0.000242 | 5.87e-05 | -0.00133*** |
| | | (0.000396) | (0.00111) | (0.000303) | (0.00155) | (0.000393) |
| | Coffee int. * log price | -0.000488 | 0.000222 | 0.00222*** | -0.00171 | 0.00120 |
| | | (0.00133) | (0.00283) | (0.000828) | (0.00466) | (0.00169) |
| | Cocoa int. * log price | 0.00242 | -0.0207** | -0.00135 | 0.00548 | 0.00235 |
| | | (0.00231) | (0.00977) | (0.00170) | (0.00881) | (0.00293) |
| | Tea int. * log price | 0.00552 | 0.336*** | -0.0444 | -0.267* | 0.0129 |
| | | (0.0236) | (0.105) | (0.0552) | (0.143) | (0.0320) |
| | Rubber int. * log price | 0.000975** | 0.00462*** | 0.00119** | 0.00152 | 0.00136*** |
| | | (0.000447) | (0.00164) | (0.000549) | (0.00171) | (0.000517) |
| 2. | Copper int. * log price | -1.89e-05*** | -6.74e-05*** | 1.84e-06 | -2.22e-05 | -1.93e-05*** |
| | | (2.75e-06) | (1.19e-05) | (9.12e-06) | (2.32e-05) | (7.33e-06) |
| | Coal int. * log price | 0.181** | 0.595** | 0.216*** | 0.0651 | 0.0111 |
| | | (0.0857) | (0.276) | (0.0660) | (0.187) | (0.0513) |
| | Gold int. * log price | -4.67e-06 | -2.18e-05* | -4.58e-06 | -8.50e-06 | -2.78e-06 |
| | | (3.71e-06) | (1.30e-05) | (3.05e-06) | (6.94e-06) | (2.19e-06) |
| | Silver int. * log price | 4.44e-05*** | -0.000119*** | 0.000105*** | 4.25e-05*** | 3.61e-05*** |
| | | (3.00e-06) | (1.13e-05) | (5.12e-06) | (1.19e-05) | (3.60e-06) |
| | Lead int. * log price | -4.63e-05* | 0.000512*** | -9.51e-05*** | 0.000625*** | 0.000211** |
| | | (2.80e-05) | (0.000171) | (1.78e-05) | (0.000102) | (8.20e-05) |
| | Tin int. * log price | 1.96e-06 | 9.78e-05** | 1.16e-05 | 7.04e-05** | -3.09e-05* |
| | | (1.00e-05) | (4.23e-05) | (1.71e-05) | (3.39e-05) | (1.67e-05) |
| | Zinc int. * log price | 0.00169*** | 0.00105* | 0.000560*** | 0.000132 | 0.000514*** |
| | | (7.63e-05) | (0.000635) | (0.000137) | (0.000357) | (0.000136) |
| | Phos. int. * log price | 0.00890*** | 0.0696*** | 0.00778*** | 0.00421 | 0.00680*** |
| | | (0.00111) | (0.00373) | (0.000955) | (0.00302) | (0.00141) |
| Observations | | 5,089 | 4,841 | 5,816 | 3,176 | 4,613 |

*Notes*: (1.) Labour intensive commodities are shown in the magnitude of thousands of hectares and (2.) capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population, HDI, demographic ratios for ages 0-15, 15-64 and 64+, and urbanisation rate. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 36: Summary of Regression Results with Respect to Channels without New or Split Districts

| | | (1) | (2) | (3) |
|---|---|---|---|---|
| | | Opportunity Cost Effect | | |
| | | Household expenditure p.c. (log) | Personnel expenditure. p.c. (log) | Employment rate |
| 1. | Palm oil int. * log price | 5.00e-05 | 0.000628*** | 8.26e-05 |
| | | (0.000154) | (0.000182) | (7.33e-05) |
| | Coffee int. * log price | 0.00103*** | -0.000343 | 6.03e-05 |
| | | (0.000206) | (0.000755) | (0.000289) |
| | Cocoa int. * log price | 0.000747 | 0.00133 | 0.000426 |
| | | (0.000941) | (0.00116) | (0.000422) |
| | Tea int. * log price | -0.0383*** | -0.0121 | 0.00485 |
| | | (0.0119) | (0.0173) | (0.00409) |
| | Rubber int. * log price | 0.00100*** | 0.000369 | -0.000154** |
| | | (0.000289) | (0.000276) | (6.46e-05) |
| 2. | Copper int. * log price | 2.32e-06 | 1.56e-05*** | 1.13e-05 |
| | | (2.11e-06) | (4.07e-06) | (9.25e-06) |
| | Coal int. * log price | 0.0153 | 0.0107 | 0.0130*** |
| | | (0.0206) | (0.0425) | (0.00280) |
| | Gold int. * log price | 2.61e-05 | 4.09e-05 | -2.39e-05*** |
| | | (3.82e-05) | (6.34e-05) | (8.99e-06) |
| | Silver int. * log price | -0.000133 | -0.00110** | 1.05e-05 |
| | | (0.000300) | (0.000489) | (0.000190) |
| | Lead int. * log price | -0.000324*** | 0.000582*** | 7.79e-05*** |
| | | (2.49e-05) | (3.45e-05) | (1.54e-05) |
| | Tin int. * log price | -5.15e-06* | -8.87e-06** | -1.92e-06 |
| | | (2.94e-06) | (3.46e-06) | (1.17e-06) |
| | Zinc int. * log price | 0.000125*** | 0.00111*** | -8.33e-05*** |
| | | (3.94e-05) | (6.54e-05) | (2.13e-05) |
| | Phos. int. * log price | -0.00408*** | 0.00425*** | -0.000672*** |
| | | (0.000434) | (0.000599) | (5.06e-05) |
| Observations | | 3,763 | 2,987 | 1,871 |

*Notes*: Labour intensive commodities are shown in the magnitude of thousands of hectares and capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population for (3), HDI, demographic ratios for ages 0-15, 15-64 and 64+, and urbanisation rate. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 37: Summary of Regression Results with Respect to Channels without New or Split Districts

| | | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| | | Rapacity Effect | | | State Capacity | |
| | | Tax Sharing (log) | Natural Res. Shar. (log) | Own rev. (log) | Law. Exp. (log) | Cap. Exp. (log) |
| 1. | Palm oil int. * log price | 0.000829 | -0.000261 | 0.000206 | 0.00111 | -0.00218** |
| | | (0.000536) | (0.00180) | (0.000580) | (0.00195) | (0.000861) |
| | Coffee int. * log price | -0.000241 | -0.00324 | 0.00266*** | 0.00654*** | -0.00155 |
| | | (0.000866) | (0.00264) | (0.000614) | (0.00192) | (0.00181) |
| | Cocoa int. * log price | 0.000858 | -0.0107 | -0.00291** | 0.0158 | 0.00827*** |
| | | (0.00162) | (0.00914) | (0.00133) | (0.0128) | (0.00304) |
| | Tea int. * log price | -0.00808 | 0.312** | 0.0207 | -0.202 | 0.0175 |
| | | (0.0266) | (0.136) | (0.0405) | (0.164) | (0.0424) |
| | Rubber int. * log price | 0.000484 | 0.00532** | 0.00100 | 0.00608*** | 0.00314*** |
| | | (0.000814) | (0.00243) | (0.00154) | (0.00163) | (0.000847) |
| 2. | Copper int. * log price | -2.44e-05*** | -8.59e-05*** | 4.05e-05*** | -9.90e-05*** | 9.79e-06 |
| | | (7.88e-06) | (2.94e-05) | (6.57e-06) | (2.58e-05) | (9.46e-06) |
| | Coal int. * log price | 0.0143 | 0.239 | 0.329*** | 0.145 | 0.0205 |
| | | (0.0676) | (0.235) | (0.0571) | (0.167) | (0.0801) |
| | Gold int. * log price | 6.21e-05 | -0.000121 | -5.94e-05 | 3.11e-05 | 0.000132 |
| | | (0.000101) | (0.000568) | (8.43e-05) | (0.000400) | (0.000171) |
| | Silver int. * log price | -0.000192 | 0.00465 | -4.60e-05 | -0.000889 | -0.000247 |
| | | (0.000893) | (0.00674) | (0.000671) | (0.00494) | (0.00220) |
| | Lead int. * log price | -0.000766*** | -0.00380*** | -0.000296* | 0.00191*** | -0.00114*** |
| | | (0.000114) | (0.000574) | (0.000153) | (0.000402) | (0.000161) |
| | Tin int. * log price | -1.85e-05* | 7.61e-05** | 1.85e-05* | 4.39e-05 | -1.05e-05 |
| | | (1.04e-05) | (3.57e-05) | (1.09e-05) | (3.59e-05) | (1.67e-05) |
| | Zinc int. * log price | 0.00168*** | 0.00173** | 0.000316*** | 0.000946** | 7.52e-05 |
| | | (0.000127) | (0.000717) | (0.000101) | (0.000428) | (0.000190) |
| | Phos. int. * log price | 0.00820*** | 0.0653*** | 0.00791*** | 0.0112*** | 0.00852*** |
| | | (0.00120) | (0.00456) | (0.000888) | (0.00333) | (0.00164) |
| Observations | | 3,354 | 3,224 | 3,836 | 2,029 | 2,970 |

*Notes*: (1.) Labour intensive commodities are shown in the magnitude of thousands of hectares and (2.) capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect, log of population, HDI, demographic ratios for ages 0-15, 15-64 and 64+, and urbanisation rate. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 38: Summary of Regression Results with Respect to Channels without Trended Control Variables

| | | (1) | (2) | (3) |
|---|---|---|---|---|
| | | Opportunity Cost Effect | | |
| | | Household expenditure p.c. (log) | Personnel expenditure. p.c. (log) | Employment rate |
| 1. | Palm oil int. * log price | -2.10e-05 | 2.75e-05 | 4.99e-05 |
| | | (9.61e-05) | (0.000240) | (4.78e-05) |
| | Coffee int. * log price | 0.000732** | -6.96e-05 | -0.000219 |
| | | (0.000313) | (0.000799) | (0.000223) |
| | Cocoa int. * log price | -0.000441 | -0.00139 | -0.000201 |
| | | (0.000585) | (0.00161) | (0.000181) |
| | Tea int. * log price | -0.0625*** | -0.0886*** | 0.00106 |
| | | (0.0157) | (0.0205) | (0.00266) |
| | Rubber int. * log price | 0.000556*** | 0.000191 | -9.53e-05*** |
| | | (0.000138) | (0.000240) | (3.20e-05) |
| 2. | Copper int. * log price | 1.91e-06 | 3.82e-06 | 1.84e-07 |
| | | (1.57e-06) | (6.74e-06) | (4.43e-06) |
| | Coal int. * log price | 0.0214 | 0.0629 | 0.00690** |
| | | (0.0134) | (0.0404) | (0.00337) |
| | Gold int. * log price | 1.70e-06** | -7.81e-07 | -2.19e-07*** |
| | | (6.92e-07) | (1.24e-06) | (7.22e-08) |
| | Silver int. * log price | 1.40e-05 | 4.04e-05 | -3.43e-06*** |
| | | (1.81e-05) | (2.87e-05) | (1.20e-06) |
| | Lead int. * log price | -6.54e-05*** | -4.70e-05 | 1.77e-05*** |
| | | (1.54e-05) | (3.27e-05) | (5.62e-06) |
| | Tin int. * log price | 3.08e-06 | 4.51e-06 | -3.53e-06** |
| | | (3.97e-06) | (1.39e-05) | (1.42e-06) |
| | Zinc int. * log price | 0.000160*** | 0.00103*** | -2.29e-05** |
| | | (2.12e-05) | (9.76e-05) | (1.16e-05) |
| | Phos. int. * log price | -0.00426*** | 0.000731 | -0.000605*** |
| | | (0.000466) | (0.000638) | (6.97e-05) |
| Observations | | 6,766 | 5,672 | 3,833 |

*Notes*: (1.) Labour intensive commodities are shown in the magnitude of thousands of hectares and (2.) capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect and log of population for (3). *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.

Table 39: Summary of Regression Results with Respect to Channels without Trended Control Variables

| | | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| | | | Rapacity Effect | | State Capacity | |
| | | Tax Sharing (log) | Natural Res. Shar. (log) | Own rev. (log) | Law. Exp. (log) | Cap. Exp. (log) |
| 1. | Palm oil int. * log price | -0.000169 | -0.00106 | -0.000500 | -0.000341 | -0.00116*** |
| | | (0.000431) | (0.00117) | (0.000312) | (0.00152) | (0.000383) |
| | Coffee int. * log price | 9.41e-06 | -0.000772 | 0.00229** | -0.00192 | 0.00102 |
| | | (0.00116) | (0.00271) | (0.00115) | (0.00453) | (0.00190) |
| | Cocoa int. * log price | 0.00206 | -0.0207** | -0.00373* | 0.00529 | 0.000983 |
| | | (0.00213) | (0.00981) | (0.00204) | (0.00845) | (0.00309) |
| | Tea int. * log price | -0.00410 | 0.324*** | -0.0631 | -0.309** | 0.00919 |
| | | (0.0203) | (0.103) | (0.0543) | (0.147) | (0.0301) |
| | Rubber int. * log price | 0.000956** | 0.00424*** | 0.000950* | 0.00152 | 0.00153*** |
| | | (0.000478) | (0.00164) | (0.000533) | (0.00159) | (0.000538) |
| 2. | Copper int. * log price | -1.81e-05*** | -6.57e-05*** | 2.80e-06 | -1.51e-05 | -1.91e-05*** |
| | | (2.43e-06) | (1.11e-05) | (1.21e-05) | (2.06e-05) | (6.44e-06) |
| | Coal int. * log price | 0.172* | 0.588** | 0.237*** | 0.0679 | 0.0308 |
| | | (0.0873) | (0.271) | (0.0677) | (0.178) | (0.0526) |
| | Gold int. * log price | 6.23e-08 | -1.61e-05 | -6.99e-07 | 3.10e-06 | -9.49e-07 |
| | | (2.97e-06) | (1.23e-05) | (5.26e-06) | (2.75e-06) | (2.23e-06) |
| | Silver int. * log price | 4.95e-05*** | -9.86e-05*** | 9.81e-05*** | 8.64e-05** | 1.82e-05 |
| | | (6.50e-06) | (1.46e-05) | (8.05e-06) | (4.27e-05) | (1.33e-05) |
| | Lead int. * log price | -6.08e-05** | 0.000455*** | -0.000108*** | 0.000639*** | 0.000205*** |
| | | (2.51e-05) | (0.000174) | (1.58e-05) | (0.000108) | (7.31e-05) |
| | Tin int. * log price | -7.88e-07 | 9.82e-05** | 1.70e-05 | 6.77e-05** | -2.97e-05** |
| | | (9.35e-06) | (3.84e-05) | (1.69e-05) | (3.38e-05) | (1.33e-05) |
| | Zinc int. * log price | 0.00160*** | 0.00108* | 0.000474*** | -0.000233 | 0.000451*** |
| | | (6.53e-05) | (0.000583) | (0.000153) | (0.000308) | (0.000102) |
| | Phos. int. * log price | 0.0102*** | 0.0722*** | 0.00532*** | 0.00370 | 0.0104*** |
| | | (0.000814) | (0.00311) | (0.00176) | (0.00254) | (0.00103) |
| Observations | | 6,017 | 5,705 | 7,038 | 3,862 | 5,648 |

*Notes*: (1.) Labour intensive commodities are shown in the magnitude of thousands of hectares and (2.) capital intensive commodities in millions of tonnes. Robust standard errors clustered at the district level are shown in the parentheses. Variables not shown are: every individual regressions' constant, year fixed effect and log of population. *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level.