The 2003-2013 Commodity Boom
and its Impact on the Productive Structure and Social Policies in Latin America

Inaugural-Dissertation
zur Erlangung des akademischen Grades
eines Doktors der Wirtschaftswissenschaft
des Fachbereichs Wirtschaftswissenschaft
der Freien Universität Berlin

vorgelegt von
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geboren in Bielefeld, Deutschland
2024

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Tag der Disputation: 09.01.2025

Co-Autorenschaft und Vorveröffentlichungen

Die vorliegende kumulative Dissertation besteht aus drei wissenschaftlichen Fachartikeln (Kapitel 2-4 der Dissertation). Das zweite Kapitel der Dissertation (*Sector-specific Dutch Disease Effects in Developing Economies*) ist in Alleinautorenschaft entstanden (Eigenanteil an Konzeption, Durchführung und Berichtabfassung: 100 Prozent). Zum Zeitpunkt der Einreichung der Dissertation wurde das Kapitel weder als Diskussionspapier noch als Fachartikel veröffentlicht.[1]

Das dritte Kapitel der Dissertation (*Regional South-South Trade and the Dutch Disease: The Case of Latin American Manufacturing Exports*) wurde in Co-Autorenschaft mit Melike Döver (FU Berlin und HTW Berlin) verfasst (Eigenanteil an Konzeption, Durchführung und Berichtabfassung: 50 Prozent). Zum Zeitpunkt der Einreichung der Dissertation wurde das Kapitel weder als Diskussionspapier noch als Fachartikel veröffentlicht.[2]

Das vierte Kapitel der Dissertation (*The Role of the Commodity Price Boom in Shaping Public Social Spending: Evidence from Latin America*) wurde in Co-Autorenschaft mit Jun.-Prof. Dr. Svenja Flechtner (Universität Siegen) verfasst (Eigenanteil an Konzeption, Durchführung und Berichtabfassung: 50 Prozent). Das Kapitel wurde 2024 in der Fachzeitschrift *World Development* veröffentlicht. Die vollständige Literaturangabe lautet:
Flechtner, Svenja, und Martin Middelanis. 2024. “The Role of the Commodity Price Boom in Shaping Public Social Spending: Evidence from Latin America.” *World Development* 182 (October): 106717. https://doi.org/10.1016/j.worlddev.2024.106717.

[1] Allerdings wurden frühere Versionen dieses Kapitels als Konferenzpapier der 26ten FMM Conference 2022 (https://www.boeckler.de/pdf/v_2022_10_21_middelanis.pdf) und als Preprint bei SSRN (Middelanis, Martin. “Sector-Specific Dutch Disease Effects in Low- and Middle-Income Countries.” Available at SSRN: http://dx.doi.org/10.2139/ssrn.4645572) veröffentlicht.

[2] Allerdings wurden frühere Versionen dieses Kapitels als Konferenzpapier der 27ten FMM Conference 2023 (https://www.imk-boeckler.de/data/downloads/IMK/FMM%20Konferenz%202023/v_2023_10_20_doever.pdf) und als Preprint bei SSRN (Döver, Melike and Martin Middelanis. “Regional South-South Trade and the Dutch Disease: The Case of Latin American Commodity Exporters.” Available at SSRN: http://dx.doi.org/10.2139/ssrn.4661008) veröffentlicht.

Acknowledgements

Many people have contributed with their support to the realization of this thesis. First and foremost, I would like to express my deep gratitude to my two supervisors, Barbara Fritz and Svenja Flechtner. I have benefited greatly from their academic expertise and their guidance in the writing process as well as in maneuvering the academic system. They are both great supervisors and friendly people who create a respectful and encouraging work environment that gives me the confidence to work on my projects. I am very grateful for all that I have learned from them and hope to continue to learn from them.

Without the input and ideas of my co-authors, large parts of this thesis would never have been written. Therefore, I would like to thank Svenja Flechtner again for the very fruitful, encouraging and successful collaboration on our joint article. The same goes for my work with Melike Döver, whom I would like to thank especially for introducing me to the world of international trade, for her love for data preparation and her incredible enthusiasm, which pushed our article forward. I would also like to thank Barbara Fritz, Luiz Fernando de Paula and José Carlos Orihuela, with whom I co-authored other articles during the preparation of the thesis, and whose insights into research and academic writing are also reflected in this thesis.

I appreciate the feedback and exchange of ideas with colleagues in the Department of Economics and the Institute for Latin American Studies at the Freie Universität Berlin and beyond. In particular, I would like to thank Christian Ambrosius, Reda Cherif, Winnie Coleman, Thomas Goda, Heike Joebges, Marina Luna, Carmen Marull, Diego Sánchez-Ancochea, Manuel Santos, and Bettina Schorr whose comments and ideas have greatly improved the quality of this dissertation.

This dissertation was written in the Internation Research Training Group Temporalities of the Future at the Institute for Latin American Studies at the Freie Universität Berlin. I am grateful for the funding provided by the German Research Foundation (DFG) for this project and for the freedom to choose my research topic and the manner in which I conducted my research. I would like to

thank Lasse Hölck for his coordination and willingness to find solutions to the problems that arose, and Elena López-Pachón for her administrative support. And I would like to thank all my fellow PhD students in the program for accepting me as a quantitative economist, for fighting bureaucratic hurdles together, for explaining to me the relevance of different concepts of temporalities, and for the great academic and non-academic exchange.

With their emotional support and the joy they bring to my life, my friends have created an atmosphere of comfort that made writing this thesis feel like a great time. Among many others, I would especially like to thank Alena, Alexandre, Anneke, Felix, Fridtjof, Julia, László, Laura, Mariana, Miriam, Rudi, and my roommates. To Laura, I am beyond that extremely grateful for returning the love I feel for her and for making me so happy. Finally, I would like to thank my family: My mother Anita for being the most loving and supportive "Bodenstation" one could ever imagine, and my brother Thomas for inspiring talks and excessive work sessions.

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List of Abbreviations

ETD	Economic Transformation Database
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
GNI	Gross National Income
GVC	Global Value Chain
PPML	Poisson Pseudo Maximum Likelihood
PTA	Preferential Trade Agreement
RME	Resource Movement Effect
SE	Spending Effect

Summary

This cumulative dissertation consists of three essays that empirically examine the influence of the commodity price boom from 2003 to 2013 on economic and social development in Latin America. Chapters 2 and 3 of this thesis examine the impact of commodity price surges on the productive structure of the economy, studying so-called Dutch Disease effects. Chapter 4 analyzes how social spending in Latin America responded to changes in commodity prices during the commodity boom.

Chapter 2: Sector-specific Dutch Disease Effects in Developing Economies

The Dutch Disease, the loss of competitiveness of tradable non-commodity sectors caused by rising commodity revenue inflows, is a widely studied phenomenon. Nevertheless, the existing literature mainly focuses on the impact on the manufacturing sector. This chapter provides new insights into the sector-specific impact of the Dutch Disease by estimating how commodity prices affect value added in four tradable and six non-tradable sectors in 46 low- and middle-income countries between 2000 and 2018. Theoretical predictions would suggest a uniform relative contraction in tradable sectors and an expansion in non-tradable sectors. However, applying a system Generalized Method of Moments panel data analysis reveals a more nuanced pattern. Of the four tradable sectors, only manufacturing is significantly negatively affected by rising commodity prices. Similarly, construction and trade services are the only non-tradable sectors to benefit from such an upswing. This empirical result suggests that the simplistic division into tradable and non-tradable sectors is not sufficient to explain the heterogeneous effects of the Dutch Disease in individual sectors. Also, the common focus on manufacturing could lead to an overestimation of the impact of the Dutch Disease.

Chapter 3: Regional South-South Trade and the Dutch Disease: The Case of Latin American Manufacturing Exports

This chapter introduces two channels through which exports from commodity-dependent countries towards regional partners might be less affected by Dutch Disease effects than extra-regional exports. The first channel relates to a higher share of technologically more sophisticated products in intra-regional South-South trade, which are less sensitive to cost and price changes. The second channel is related to trade barriers and entry costs faced by extra-regional competitors in the regional market. The two channels are empirically tested through a panel data analysis of manufacturing exports from Latin American countries between 1996 and 2018. The evolution of exports to regional export partners is compared to extra-regional exports. Dutch Disease effects are most pronounced in exports to extra-regional partners, where a one-percent increase in commodity prices leads to a 0.48% decline in manufacturing exports, significantly larger than the 0.31% decline in regional trade. The effect is mainly driven by low-tech exports, which are more negatively affected than medium- and high-tech exports, with an elasticity of -0.95% in extra-regional trade compared to -0.58% in regional trade. The results support both channels, suggesting that technological upgrading and regional trade integration can mitigate the contraction of the manufacturing sector during commodity price booms.

Chapter 4: The Role of the Commodity Price Boom in Shaping Public Social Spending: Evidence from Latin America

The commodity price boom from 2003 to 2013 is commonly credited with the concurrent decline in inequality in Latin America during this period. Increased social spending could be a key driver of the decline in inequality in the region. This chapter examines the impact of the commodity price boom in Latin America on public social spending, particularly on health, education, and social protection, in 16 countries from 1990 to 2019. Using structural vector autoregressions and local projections, the analysis reveals very different responses across countries. Argentina and Ecuador experienced sustained increases in all categories of social spending, while others, such as Brazil and Mexico, experienced temporary increases. Chile showed initial declines before increases, and countries such as Bolivia, Colombia, and Peru showed no significant response. Countries without commodity booms showed no relationship between rising commodity prices and social spending. Attempts to explain the mixed results found no consistent pattern related to political ideology, fiscal rules, natural resource funds, or commodity dependence, although wealthier and more diversified economies were more likely to sustain increased social spending. The results challenge the assumption that the commodity price boom was a key driver of social spending growth in Latin America, emphasizing that it was neither a necessary nor a sufficient condition for such expansion. The chapter highlights the importance of country-specific political and economic factors and calls for more detailed research, as regional trends may mask individual country differences.

Zusammenfassung

Diese kumulative Dissertation besteht aus drei Aufsätzen, die den Einfluss des Rohstoffpreisbooms von 2003 bis 2013 auf die wirtschaftliche und soziale Entwicklung in Lateinamerika empirisch untersuchen. In den Kapiteln 2 und 3 dieser Arbeit werden die Auswirkungen des Rohstoffpreisbooms auf die produktive Struktur der Wirtschaft, die sogenannten Dutch Disease-Effekte, untersucht. In Kapitel 4 wird analysiert, wie die Sozialausgaben in Lateinamerika auf die Veränderungen der Rohstoffpreise während des Rohstoffbooms reagierten.

Kapitel 2: Sector-specific Dutch Disease Effects in Developing Economies

Die Holländische Krankheit, der Verlust der Wettbewerbsfähigkeit von handelbaren Nicht-Rohstoffsektoren, der durch steigende Rohstoffeinnahmen verursacht wird, ist ein weithin untersuchtes Phänomen. Dennoch konzentriert sich die vorhandene Literatur hauptsächlich auf die Auswirkungen auf das verarbeitende Gewerbe. Dieses Kapitel bietet neue Einblicke in die sektorspezifischen Auswirkungen der Holländischen Krankheit, indem es schätzt, wie sich die Rohstoffpreise auf die Wertschöpfung in vier handelbaren und sechs nicht handelbaren Sektoren in 46 Ländern mit niedrigem und mittlerem Einkommen zwischen 2000 und 2018 auswirken. Theoretische Vorhersagen würden einen einheitlichen relativen Rückgang in handelbaren Sektoren und einen Aufschwung in nicht handelbaren Sektoren nahelegen. Die Anwendung einer Generalized Method of Moments-Panel-Datenanalyse zeigt jedoch ein differenzierteres Muster. Von den vier handelbaren Sektoren ist nur das verarbeitende Gewerbe von den steigenden Rohstoffpreisen signifikant negativ betroffen. In ähnlicher Weise sind das Baugewerbe und die Handelsdienstleistungen die einzigen nicht handelbaren Sektoren, die von einem solchen Aufschwung profitieren. Dieses empirische Ergebnis deutet darauf hin, dass die vereinfachende Einteilung in handelbare und nicht handelbare Sektoren nicht ausreicht, um die heterogenen Auswirkungen der Holländischen Krankheit in den einzelnen Sektoren zu erklären. Auch könnte die übliche Fokussierung auf das verarbeitende Gewerbe dazu führen, dass die Auswirkungen der Holländischen Krankheit überschätzt werden.

Kapitel 3: Regional South-South Trade and the Dutch Disease: The Case of Latin American Manufacturing Exports

In diesem Kapitel werden zwei Kanäle vorgestellt, über die Exporte aus rohstoffabhängigen Ländern in Richtung regionaler Partner weniger stark von den Auswirkungen der Holländischen Krankheit betroffen sein könnten als Exporte in andere Regionen. Der erste Kanal hängt mit einem höheren Anteil technologisch anspruchsvollerer Produkte im intraregionalen Süd-Süd-Handel zusammen, die weniger empfindlich auf Kosten- und Preisänderungen reagieren. Der zweite Kanal hängt mit den Handelshemmnissen und den Markteintrittskosten zusammen, denen sich die außerregionalen Wettbewerber auf dem regionalen Markt gegenübersehen. Die beiden Kanäle werden empirisch anhand einer Paneldatenanalyse der Exporte des verarbeitenden Gewerbes aus lateinamerikanischen Ländern zwischen 1996 und 2018 getestet. Die Entwicklung der Exporte zu regionalen Exportpartnern wird mit der Entwicklung der überregionalen Exporte verglichen. Die Auswirkungen der Holländischen Krankheit sind bei den Exporten zu außerregionalen Partnern am stärksten ausgeprägt, wo ein Anstieg der Rohstoffpreise um ein Prozent zu einem Rückgang der Exporte des verarbeitenden Gewerbes um 0,48 % führt, der deutlich stärker ist als der Rückgang des regionalen Handels um 0,31 %. Die Auswirkung ist hauptsächlich auf Exporte von Niedrigtechnologieprodukten zurückzuführen, die stärker betroffen sind als Exporte von Mittel- und Hochtechnologieprodukten, mit einer Elastizität von -0,95 % im außerregionalen Handel gegenüber -0,58 % im regionalen Handel. Die Ergebnisse stützen beide Kanäle, was darauf hindeutet, dass technologische Modernisierung und regionale Handelsintegration den Rückgang des verarbeitenden Gewerbes während eines Rohstoffpreisbooms abmildern können.

Kapitel 4: The Role of the Commodity Price Boom in Shaping Public Social Spending: Evidence from Latin America

Der Rohstoffpreisboom von 2003 bis 2013 wird gemeinhin für den gleichzeitigen Rückgang der Ungleichheit in Lateinamerika während dieses Zeitraums verantwortlich gemacht. Erhöhte Sozialausgaben könnten eine wichtige Rolle für den Rückgang der Ungleichheit in der Region spielen. In diesem Kapitel werden die Auswirkungen des Rohstoffpreisbooms in Lateinamerika auf die öffentlichen Sozialausgaben, insbesondere in den Bereichen Gesundheit, Bildung und soziale Absicherung, in 16 Ländern von 1990 bis 2019 untersucht. Unter Verwendung struktureller Vektor-Autoregressionen und lokaler Projektionen zeigt die Analyse sehr unterschiedliche Reaktionen in den einzelnen Ländern. Argentinien und Ecuador verzeichneten einen nachhaltigen Anstieg aller Kategorien von Sozialausgaben, während andere Länder, wie Brasilien und Mexiko, einen vorübergehenden Anstieg erlebten. In Chile kam es zunächst zu einem Rückgang, dann zu einem Anstieg, und Länder wie Bolivien, Kolumbien und Peru zeigten keine nennenswerte Reaktion. Länder ohne Rohstoffboom zeigten keinen Zusammenhang zwischen steigenden Rohstoffpreisen und Sozialausgaben. Versuche, die gemischten Ergebnisse zu erklären, ergaben kein einheitliches Muster, das mit der politischen Ideologie, den Steuervorschriften, den natürlichen Ressourcen oder der Rohstoffabhängigkeit zusammenhängt. Der einzige erkennbare Trend ist, dass wohlhabendere und diversifiziertere Volkswirtschaften eher in der Lage waren, höhere Sozialausgaben zu tätigen. Die Ergebnisse stellen die Annahme in Frage, dass der Rohstoffpreisboom der Hauptfaktor für den Anstieg der Sozialausgaben in Lateinamerika war, und betonen, dass er weder eine notwendige noch eine hinreichende Bedingung für eine solche Erhöhung war. Das Kapitel unterstreicht die Bedeutung länderspezifischer politischer und wirtschaftlicher Faktoren und zeigt die Wichtigkeit von Fallstudien auf, da regionale Trends die Unterschiede zwischen den einzelnen Ländern überdecken können.

Chapter 1
Introduction

After decades of mostly disappointing economic performance and rising inequality (Bértola and Ocampo 2012), Latin American economies seem to have turned the corner in the early 2000s. Growth rates were much higher than in previous decades (Gruss 2014), and contrary to global trends, inequality (and poverty) declined substantially throughout the region (Cornia 2016). The good economic and social performance has even been labeled the Latin American Decade (Moreno Mejía 2011). As many Latin American countries depend on commodity exports, and commodity prices experienced an unprecedented surge from 2003 to 2013, this commodity price boom is often credited with the region's good social and economic performance during its duration (IMF 2018). When commodity prices began to fall again in 2013, Latin America's economic dynamism evaporated, leading to near stagnation, while inequality began to rise again (Ocampo and Gómez Arteaga 2017; Ocampo 2017b).

This trajectory of socio-economic development raises at least two questions: First, whether the commodity price boom had a positive impact on social and economic development in Latin America, and second, why the positive path of social and economic development could not be continued in the post-boom period. In this context, this dissertation contributes to the understanding of the short- and medium-term effects of the commodity price boom. Positioning itself within an extensive literature that examines the impact of the commodity price boom on Latin America, the dissertation focuses particularly on the implications for the productive structure and social policies. The three empirical essays included in this cumulative dissertation each address sub-questions that contribute to answering the overall research question of how the commodity price boom from 2003 to 2013 affected the productive structure and the use of social policy in Latin America. It should be noted that the second chapter addresses the issue of structural change induced by the commodity price boom on a more general basis. To this end, the sample of countries examined is not limited to Latin America, but also includes other developing economies. Nevertheless, the results provide important insights for commodity dependent Latin American economies.

This chapter’s purpose is to introduce the contexts of the research of this dissertation, explain the choice of topics of the three following chapters, summarize their findings, and present some conclusions that can be drawn from this dissertation. The relevant contexts include the theoretical implications of commodity dependence and commodity price booms, the role of commodities in Latin American economies, and the evolution of the 2003-2013 commodity price boom in the region.

1.1 Economic Effects of Commodity Dependence and Commodity Price Booms

This dissertation contributes to the literature that examines the implications of commodity dependence for social and economic development. The abundance of most commodities is determined by geological endowments, most clearly for non-renewable resources such as hydrocarbons and minerals, but also for agricultural products, where better geological conditions provide a significant production advantage. As a result, a country's ability to rely on commodities for its economic development depends mainly on the "commodity lottery" (Bulmer-Thomas 2014, 15) and much less on political decisions. This commodity abundance, however, does not automatically translate into commodity dependence, meaning that a large share of a country's exports (or gross domestic product (GDP)) is derived from natural resource extraction.

While resource abundance can be beneficial for economic development (Brunnschweiler and Bulte 2008), resource dependence is associated with inferior development trajectories (Sachs and Warner 1995). This so-called "resource curse" (Auty 1994, 11) refers to several peculiar effects of commodity-based economic development. In addition to political factors such as the undermining of democracy (Ross 2001; Collier and Hoeffler 2009) and increasing corruption and conflict (McFerson 2009; Arezki and Brückner 2011), which have a negative impact on economic growth, there are also some more explicitly economic factors. According to the center-periphery theory of Prebisch (1950) and Singer (1950), commodities face a relative decline in prices compared to manufactured products and services in the long run. Countries dependent on commodity exports therefore face declining terms of trade and reduced opportunities for economic development. Another problem is that commodity extraction, which is mainly capital-intensive, creates relatively few jobs and domestic value-added (Singer 1950). Moreover, commodity sectors offer limited opportunities for technological upgrading (Krugman 1987) and few linkages to other sectors (Hausmann and Hidalgo 2011). This enclave mentality prevents other sectors from benefiting from the expansion of commodity sectors and broader economic development. Commodity prices are much more volatile than industrial product prices, leading to similarly volatile revenues (Gómez Sabaini et al. 2018). Difficulties in fiscal planning and macroeconomic and financial instability are the consequences for commodity-dependent countries (Ocampo 2017a).

The volatile nature of commodity prices creates boom and bust dynamics. There are several theoretical considerations on how commodity price booms affect economic development in commodity-dependent countries. First, commodity price booms are likely to lead to a substantial increase in foreign financial inflows, as a large share of exports can be sold at higher prices (Arezki et al. 2018). Governments capture a share of these windfall gains through state-owned enterprises, taxation, or royalty schemes (Jiménez and Tromben 2006). The increases in fiscal budgets can be used to contribute to commodity-led development, in the sense that revenues from commodity exports are spent with the aim of promoting economic and/or social development (Barma et al. 2012). At the same time, higher commodity prices increase the value of the government's collateral, thereby providing better conditions for borrowing (Juvenal and Petrella 2024). This access to credit, on the one hand, provides the opportunity for increased spending to promote economic and social development, but on the other hand, it carries with it the risk of overspending during the boom, leading to an increase in the government's debt burden (Abeles and Valdecantos 2019). In bust times, when revenues collapse and access to credit is more costly, servicing this debt becomes a challenge, requiring spending cuts and implying unsustainable pro-cyclical fiscal policies (Talvi and Vegh 2005).

The surge in financial inflows during a commodity price boom and the increase in government spending can also contribute to the so-called Dutch Disease effect (Corden and Neary 1982). This spending leads to an increase in the demand for tradable and non-tradable goods and services, which can be satisfied by imports for tradables, but leads to an increase in the prices of non-tradables. This relative price increase in the domestic non-tradable sector relative to the internationally fixed prices of the tradable sector corresponds to a real exchange rate appreciation. At the same time, the booming commodity sector becomes more productive, able to pay higher wages and rents on capital, which raises the prices of factors of production (Heresi 2023). The real exchange rate appreciation induced by the spending effect and the increase in the price of production factors due to the resource movement effect both imply higher production costs for the domestic tradable sector, which consequently loses international competitiveness and contracts. A commodity price boom therefore implies a shift in the structure of production from non-resource tradable sectors to commodity sectors. The impact on non-tradable sectors depends on the relative strength of the two effects: A relatively stronger spending effect leads to an expansion of the non-tradable sector, while a relatively stronger resource movement effect leads to a contraction (Corden and Neary 1982; Corden 1984).

Re-primarization, or the structural shift to the commodity sector, is considered problematic for economic development not only because it increases dependence on commodities, but also because it leads to premature de-industrialization, as the main tradable sector that shrinks is the manufacturing sector (Rodrik 2016). In contrast to the shortcomings of the commodity sector, the manufacturing sector has some characteristics that make it the most promising sector for economic development in developing economies (Szirmai 2012; Haraguchi et al. 2017; Su and Yao 2017; Gabriel and de Santana Ribeiro 2019). This includes its potential for economies of scale, technological learning, linkages to other sectors, and creation of qualified jobs (van Wijnbergen 1984b; Krugman 1987; Hidalgo et al. 2007).

1.2 Commodities and Development: The Case of Latin America

The regional focus of this dissertation is Latin America. Although Latin America is a very heterogeneous region with specific economic trajectories in different countries, the region shares some commonalities in terms of economic development. Since the colonial period, Latin America's integration into the world market has been based mainly on the export of commodities (Bértola and Ocampo 2012). An attempt to reduce dependence on commodity exports and increase industrial production in the region was an inward-looking policy, commonly referred to as import-substituting industrialization (Hirschman 1968), but perhaps more accurately described by Cárdenas et al. (2000) as state-led industrialization. During this period, from the 1930s to the 1980s, the focus was on industrialization for the domestic market, and the share of Latin American economies in world trade declined. However, since, with some exceptions, industries were barely competitive in international markets, countries still relied on commodity export revenues to generate foreign exchange (Ocampo 2017a). With liberalization reforms, trade regained importance in Latin America since the 1980s, and despite a greater reliance on competitive advantages, the region's share of commodities in total merchandise exports almost halved between 1980 and the turn of the millennium (Bulmer-Thomas 2014). However, this decline was partly due to a sharp drop in commodity prices (Ocampo 2017a). Thus, even before the commodity price boom, commodities were still a mainstay of economic development in many countries in the region (Sinnott et al. 2010).

The experience of commodity dependence and the struggle for industrialization varies widely across the region. Countries in the north of the region, especially Mexico, have a larger share of manufacturing exports, mainly within global value chains with relatively low domestic value added, destined for the US market. Although Mexico is also an oil exporter, the main commodity exports of these Central and North American countries are agricultural products. In South America, on the other hand, most extra-regional exports are based on natural resources, while more diversified (and technologically more advanced) products are traded within the region (Ocampo 2017a). In the Andean countries, oil (Venezuela, Colombia, Ecuador), gas (Bolivia), and minerals (Chile, Peru) dominate export structures, while Brazil (in addition to iron and oil), Argentina, Uruguay, and Paraguay account for significant shares of agricultural exports (The Growth Lab at Harvard University, n.d.).

Not only do the export structures of Latin American countries vary widely, but there are also significant differences in economic development within the region. While the average gross national income (GNI) in Latin America is only one-fifth that of high-income countries, Chile's GNI is ten times that of Nicaragua (in 2010) (Bulmer-Thomas 2014). These economic disparities exist not only between countries in the region. Income and wealth are also very unequally distributed within countries. Before the commodity price boom began in 2003, Latin America was the most unequal region in the world, characterized by persistently high levels of inequality (Birdsall et al. 2012).

1.3 The 2003 to 2013 Commodity Price Boom in Latin America

Starting in 2003, prices for most commodities began to rise sharply until the onset of the Great Financial Crisis in 2008. While the crisis caused a short-lived decline in commodity prices, they recovered quickly and remained at high levels until around 2013, when they began to fall sharply (see Figure 1.1). Prices for different commodities did not rise at the same pace or to the same level. Particularly, extractive commodities experienced strong price increases, reaching levels more than four times higher than in 2000 for base metals and energy (including oil, gas, and coal) and more than five times higher for precious metals. By comparison, agricultural prices rose less sharply, but still more than doubled during the boom.

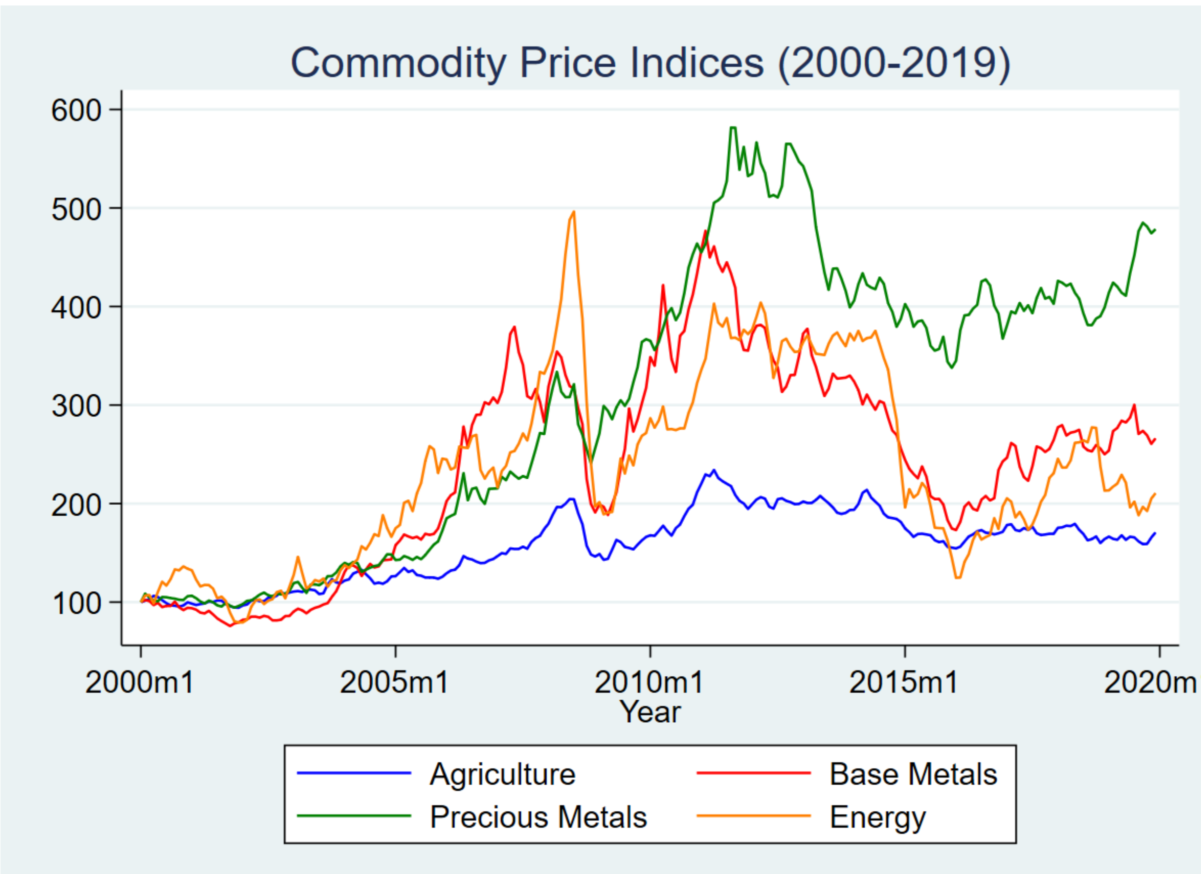

Figure 1.1: Evolution of prices of various commodities from 2000 to 2019, index 2000m1=100.
Source: Elaboration by the author. Data from IMF Primary Commodity Prices database.

For most Latin American commodity exporters, the commodity price boom of 2003 to 2013 was unprecedented in terms of magnitude and duration (Erten and Ocampo 2013; Gruss 2014). The

Andean countries, whose export commodities experienced the most pronounced price increases, in particular, but also Argentina and Brazil (and to a lesser extent Mexico), experienced significant improvements in their terms of trade during the boom, implying rising external financial inflows (Ocampo 2017a). The boom was accompanied by economic growth that exceeded that of previous decades. Across the region, the average annual growth rate rose from 2.5 percent in 1980-2002 to more than 4 percent in 2003-2011 (Gruss 2014). Similarly, during the boom, inflation fell sharply from on average more than 100 percent per year in previous decades to on average 6.5 percent per year (Ocampo et al. 2018). The strong economic performance was accompanied by improvements in social indicators, as the share of the population living in poverty fell from an average of 21.8% in the previous decade to 7.6% (Ocampo et al. 2018), and inequality, as measured by the average regional Gini coefficient, fell by 6.1 points between 2003 and 2012 (from 54.1 to 48), more than offsetting the increase in inequality the region had experienced in the previous two decades (Cornia 2016).

The main driver of the commodity price boom was rising international demand due to strong economic development, especially in China. Chinese economic growth had a dual impact on Latin American economies. On the one hand, Chinese demand for commodities led to increased revenues from commodity exports. On the other hand, Chinese manufactured products entered international markets at very competitive prices, putting pressure on the region's manufacturing sectors (Jenkins 2012; Gallagher and Porzecanski 2008). Both trends led to a shift toward greater commodity dependence in Latin American exports (Ocampo 2017a).

The fall in commodity prices was driven by slowing economic growth in China, which reduced its demand for commodities, while economic performance in the US and Europe remained relatively weak (IMF 2014). This weaker demand was confronted with an increase in supply, as the high prices during the boom period encouraged the expansion of production, which was slow to come on stream. In addition, the shale oil boom in the United States increased the supply of oil (Baffes et al. 2022). Latin American countries, especially commodity exporters, experienced how the growing dependence on commodities increased their vulnerability to falling prices in the post-boom period (Abeles and Valdecantos 2019). Economic development in the region was much weaker in the years following the commodity price boom, to the point that it was even referred to as Latin America's new lost decade (Ocampo 2021).

1.4 The Dissertation's Approach to study the Commodity Price Boom

Latin American economies have substantially lower income levels than industrialized economies and face higher levels of inequality and poverty. Consequently, it is a relevant (and much studied) question what hinders social and economic development in the region. Given the importance of the 2003-2013 commodity price boom for the region, this dissertation addresses this question by examining whether the commodity price boom had a positive impact on social and economic development and why social and economic development experienced a slump in the post-boom years. To this end, the following chapters of this cumulative dissertation, chapter 2 and 3 analyze the productive structure of the economies, while the fourth focuses on social policies.

The second, single-authored chapter, *Sector-specific Dutch Disease Effects in Developing Economies,* sheds light on specific Dutch Disease effects in different sectors. While there is already an extensive literature on the Dutch Disease, most theoretical and empirical studies consider the emblematic tradable and non-tradable sectors of the baseline model as homogeneous. Instead, the second chapter of this dissertation adds the novelty of examining the particular effects on several tradable and non-tradable sectors. Notably, this chapter does not focus exclusively on Latin America but includes 46 developing economies in Africa, Latin America and Asia to carve out general tendencies of the Dutch Disease which are not necessarily specific to Latin America. Including developing economies from other regions provides a larger sample and more econometric possibilities. Analyzing panel data from 2000 to 2018, heterogeneous responses to rising commodity prices across different tradable and non-tradable sectors are found. In particular, manufacturing is the only one out of four tradable sectors that is negatively affected by Dutch Disease effects, and out of six non-tradable sectors, only construction and trade services respond to rising commodity prices with a relative increase in value added.

These results are mainly relevant for a better understanding of the underlying mechanisms of the Dutch Disease. They show that the simple division into tradable and non-tradable sectors does not provide an adequate explanation for sector-specific responses to commodity price increases. In particular, they question the common practice of studying Dutch Disease effects by examining the manufacturing sector as representative of the tradable sector. In this way, the particularly negative effects on the manufacturing sector are generalized to the entire tradable sector.

Building on the second chapter's finding that the manufacturing sector is at risk of suffering from Dutch Disease effects, the third chapter, *Regional South-South trade and the Dutch Disease: The Case of Latin American Manufacturing Exports*, asks to what extent this decline in manufacturing exports might vary across different export destinations. Co-authored with Melike Döver, we propose two novel channels explaining why, in developing economies, manufacturing exports to regional trade partners should be less affected by Dutch Disease effects than exports to extra-regional trade partners. The first channel, the technological sophistication channel, suggests that technologically more sophisticated products are less affected by Dutch Disease effects due to lower price and cost elasticity. In regional South-South trade, the share of technologically more sophisticated products is higher than in extra-regional exports. Thus, regional trade may be less affected by the Dutch Disease. The second channel, the market entry costs and trade barriers channel, states that the Dutch Disease reduces the international competitiveness of manufacturing producers, which are consequently replaced by competitors that do not suffer from the Dutch Disease. The main competitors are extra-regional industrial exporters. However, they face relatively higher costs in regional trade due to market entry costs and trade barriers, including transportation costs and exclusion from regional trade agreements. At the same time, when a commodity price boom affects several countries in the region, regional competitors may suffer a loss of competitiveness due to Dutch Disease effects. As a result, a commodity-dependent country's exports to regional trade partners may suffer a smaller relative decline in competitiveness than its exports to extra-regional trade partners.

Empirically, we test our theoretical arguments using a Poisson Pseudo Maximum Likelihood Estimator with high-dimensional fixed effects on panel data of Latin American bilateral exports to 236 trade partners from 1996 to 2018. We find that exports to regional trade partners are indeed less negatively affected by rising commodity prices than exports to extra-regional trade partners. This difference is mainly driven by low-technology exports. First, low-technology exports are much more affected by rising commodity prices than more sophisticated exports, and second, the difference between regional and extra-regional exports is only significant for this technology category.

Our results provide a strong case for regional integration and technological upgrading (mainly from low to medium technology) for developing economies to become more resilient to commodity price changes and to avoid undesirable Dutch Disease effects.

The fourth chapter, *The Role of the Commodity Price Boom in Shaping Public Social Spending: Evidence from Latin America*, looks at the impact of the commodity price boom in Latin America for social development.[3] Co-authored with Svenja Flechtner, we examine whether the rise in commodity prices can be linked to an increase in social spending. While it is often implicitly assumed that the commodity price boom enabled the rise in social spending in the region, no other study has rigorously examined this relationship empirically. We run structural vector auto regressions and local projections for 16 Latin American countries separately over the period from 1990 to 2019 to observe whether rising commodity prices are associated with increases in the main categories of social spending: health, education, and social protection. We find very heterogeneous results across countries. While Argentina and Ecuador experienced sustained increases in all categories of social spending, other countries experienced only short-lived increases in some categories, and Bolivia, Colombia, and Peru, as well as all countries that did not experience a commodity price boom, showed no significant response at all. We try to find factors that might explain the heterogeneous results, but neither the political ideology of governments, nor fiscal rules, natural resource funds, nor the degree of commodity dependence can provide consistent explanations for our findings. Only the tendency for richer and more diversified countries to translate commodity price surges into more sustained increases in social spending holds for most of our results (except for Ecuador).

[3] This chapter has been published as: Flechtner, Svenja, and Martin Middelanis. 2024. "The Role of the Commodity Price Boom in Shaping Public Social Spending: Evidence from Latin America." *World Development* 182 (October): 106717. https://doi.org/10.1016/j.worlddev.2024.106717. Therefore, it is not included in this document, but to be consulted separately (it is available to everyone thanks to open access).

Relevant lessons from this chapter are that the importance of the commodity price boom for the expansion of social spending in Latin America may be overstated, as it was neither a necessary nor a sufficient condition. In addition, the results suggest that country experiences vary widely, arguing for the need to take into account specific domestic political and economic conditions, while regional trends may mask the diversity of results.

1.5 Conclusions to be drawn from the Dissertation

The dissertation uses three different methods of quantitative data analysis, each with its own strengths and weaknesses, but each well suited to answer the respective research question. The choice of methodology was also influenced by the availability and quality of data. The availability of high-quality data is a major limitation of this dissertation, but a limitation faced by most research on developing economies. For both social expenditure and sectoral value added, much more detailed and disaggregated data would have been available for developed countries. Nevertheless, the variety of methodologies used allows different questions to be addressed with the available data. Taken together, the results of these questions can contribute to answer the overall research question and to understand the short- and medium-term impact of the commodity price boom.

Regarding the productive structure, the second and third chapter point out that the commodity price boom did indeed cause structural change. In particular, manufacturing declined due to Dutch Disease effects. While in the short run this decline may have been more than offset by the windfall gains from the commodity sectors, this structural change may have had negative consequences for economic performance in the post-boom years. However, the two chapters also show that Dutch Disease effects are not universal and that there are ways to avoid and mitigate these effects. The second chapter suggests that tradable sectors other than manufacturing may offer a more resilient alternative for economic development in commodity-dependent countries, while the third chapter highlights that within manufacturing, technological upgrading can help mitigate Dutch Disease effects. Increasing regional trade integration and exporting to regional trade partners can also contribute to becoming more resilient to Dutch Disease effects. These findings suggest that a pronounced structural change due to rising commodity prices is not without alternatives but can at least be mitigated by adapting the production and trade structure.

Regarding the second part of the research question, the social policy implications of the commodity price boom, the fourth chapter shows that in some countries the commodity price boom had a positive impact, at least through short-term increases in social spending. In other countries, these effects could even be extended into the post-boom period through long-lasting increases in social spending. Overall, however, there was no universal positive effect of the commodity boom on social spending in Latin America, and it was neither necessary nor sufficient for the expansion of social spending in the region. This finding suggests that the boom had a partial but limited direct impact on social policy in Latin America.

Chapter 2

Sector-specific Dutch Disease Effects in Developing Economies

2.1 Introduction

The Dutch Disease refers to the deterioration of non-commodity tradable sectors, caused by rising commodity revenue inflows. Since its theoretical foundation by Corden and Neary in 1982, this phenomenon has been studied extensively. The theoretical literature, as well as most empirical studies, assumes that the manufacturing sector represents the tradable sector and that a unified service sector represents the non-tradable parts of the economy (Brahmbhatt et al. 2010; Mien and Goujon 2021). Possible differences in the responses of different tradable and non-tradable sectors are rarely taken into account. Still, different tradable sectors are not homogeneous and have different characteristics which may make them more or less prone to be affected by the Dutch Disease. The same is true for different non-tradable sectors. Consequently, the classification into these two categories may be too simplistic.

The interest of this chapter is to find out if there is indeed a heterogeneous impact of the Dutch Disease on different tradable and non-tradable sectors, respectively. To this end, we examine the impact of commodity price changes on value added in four tradable and six non-tradable sectors in developing economies. The sectoral differentiation allows for a more detailed examination of the sectorally differentiated outcomes of Dutch Disease effects in both tradable and non-tradable sectors. In this way, the chapter contributes to a better understanding of the mode of operation of the Dutch Disease and its implications for specific sectors.

A two-step system GMM approach (Blundell and Bond 1998) is applied to analyze how commodity prices affect value added in tradable and non-tradable sectors in commodity-dependent low- and middle-income countries. The panel data analysis covers 46 countries and annual observations from 2000 to 2018, a period that includes both the commodity price boom from 2003 to 2013 and subsequent years. Since this was the strongest commodity price boom ever experienced by many countries (Erten and Ocampo 2013), it provides a fruitful case for studying Dutch Disease effects.

The theory of Dutch Disease predicts that all tradable sectors are negatively affected by rising commodity prices, due to real exchange rate appreciation and a decline in the competitiveness of export industries. Similarly, it assumes that non-tradable sectors benefit from commodity revenues, as the inflow of revenues increases the demand for non-tradable goods and services. However, the results show that this is only true at a more aggregate level when the ratio of manufacturing to services or the ratio of tradable to non-tradable sectors is used as the dependent variable. In the sectoral analysis, manufacturing is the only one of the four tradable sectors that is adversely affected by rising commodity prices. Construction and trade services are the only two of the six non-tradable sectors to benefit. This shows that the simple distinction between tradable and non-tradable sectors is not sufficient to predict the sector-specific impact of the Dutch Disease. Additionally, it highlights that the common practice to study the manufacturing sector as a representative tradable sector may overestimate the effects of the Dutch Disease.

The remainder of the chapter is organized as follows. Section 2.2 presents the underlying theoretical literature on Dutch Disease and Section 2.3 presents the empirical evidence for this phenomenon. Section 2.4 describes the data and Section 2.5 the methodology. The results are presented in Section 2.6 and discussed in Section 2.7. Section 2.8 concludes the chapter.

2.2 Theoretical Background

The Dutch Disease theory offers a critical view of the possibilities of commodity export-led development. The basic model of Corden and Neary (1982) departs from a three sector economy. The resource sector and the manufacturing sector produce tradable goods, while the service sector produces non-tradable goods.[4] The model further implies that an external shock - e.g. a windfall

[4] In the description of the theoretical model, services imply non-tradability. This assumption is then modified in the empirical part of this chapter.

of resource revenues - leads to a boom in the resource sector, causing two effects: the resource movement effect (RME) and the spending effect (SE).

As the resource sector expands due to the positive external shock, its demand for labor increases. Wages in this sector rise, leading to the RME as labor is attracted from the manufacturing and the service sector (Corden and Neary 1982). The SE is caused by the economy's increased income due to the positive external shock in the commodity sector. This income is spent on consumption in the manufacturing and service sectors. Since manufacturing is tradable, the increased demand can be met by imports; this is not possible for non-tradable services. Consequently, the price of services rises to neutralize the excess demand. This increase in the price of non-tradables relative to tradables is the definition of real exchange rate appreciation. It leads to a loss of international competitiveness of the manufacturing sector (Corden and Neary 1982).

The combination of the two effects leads to an even stronger appreciation of the real exchange rate, as the increased demand for services from the SE is confronted with lower output in the service sector due to the RME. While both the SE and the RME lead to a decline in manufacturing output, the service sector declines only when the RME is relatively stronger than the SE, while it expands when the SE is stronger (Corden and Neary 1982). Empirical observations show that resource extraction is capital intensive and employment is marginal relative to the economy as a whole (Davis 2011; Cust and Poelhekke 2015). Consequently, the RME is estimated to be rather small in the case of a commodity price boom (Davis 1995). Under these circumstances, a commodity price boom is expected to have a negative impact on tradable sectors, while the impact on non-tradable sectors should be positive.

Although this basic model describes a neutral shift in factor allocation, the Dutch Disease is credited with posing an economic challenge. Compared to commodity sectors, manufacturing offers more opportunities for learning-by-doing (Krugman 1987; van Wijnbergen 1984a), more potential for economies of scale and labor creation (Singer 1950), more linkages with other sectors, and thus better conditions for technological innovation (Hidalgo et al. 2007). Due to these properties, especially for developing economies, manufacturing is the most promising sector for economic development and deindustrialization is a feared outcome of the Dutch Disease (Rodrik 2013; 2016).[5]

While the theoretical model of the Dutch Disease includes only three sectors, there are also other tradable sectors apart from the commodity sectors (agriculture and mining) and manufacturing. According to the classification of Mano and Castillo (2015), which is further described in Section 4, some services such as transport, business and financial services can also be classified as tradable sectors. Transport and business services are part of the so-called "industries without smokestacks" (Newfarmer et al. 2018), which are sectors that share important characteristics with manufacturing. These include tradability, high value added per worker, opportunities for technological upgrading, economies of scale, and the ability to employ many moderately skilled workers (Page 2020). These characteristics place them, like manufacturing, in a favorable position for sustained economic development. Trade in these services has become increasingly important in recent decades, growing much faster than trade in goods (Spatafora et al. 2012; Page 2020). Consequently, studying possible Dutch Disease effects on these sectors provides important insights for the development prospects of developing economies.

Focusing the analysis on developing economies provides a good sample for analyzing Dutch Disease effects. Due to a lack of absorption capacities in the non-traded sector (van der Ploeg 2011; van der Ploeg and Venables 2013), weaker institutions (Amiri et al. 2019; Bjørnland et al. 2019), a higher productivity gap towards trade partners (Cherif 2013), and higher inequality (Behzadan et al. 2017), the impact of the Dutch Disease is likely to be stronger in these economies than in industrialized economies.

[5] It should be noted that some studies question this superiority of the manufacturing sector over the commodity sectors (see e.g. Torvik 2001; W. Martin and Mitra 2001; Kojo 2014; Addison and Roe 2024).

2.3 Empirical Evidence

While there is an extensive empirical literature on the Dutch Disease, there are only a few studies which focus on differentiated effects on different sectors. The only common differentiation is the one derived from the theoretical model between tradable manufacturing and non-tradable services (e.g. Bjørnland and Thorsrud 2016; Alberola and Benigno 2017). One example is Reisinezhad (2024), who distinguishes between manufacturing and a unified service sector in his panel study of 152 countries. He finds that a commodity boom reduces growth in both sectors, with a stronger effect on manufacturing. This finding is explained by a shift of labor from manufacturing to services, lost learning-by-doing opportunities, and a consequent decline in productivity.

Perhaps the only study that includes tradable services in the analysis comes from Harding and Venables (2016). They examine the impact of a windfall in non-renewable resource revenues on exports in 41 countries and find that a one US-dollar increase in non-renewable resource revenues reduces other exports by 74 cents. Within these exports, manufacturing is more affected than agricultural products and services. The authors explain this result by the higher mobility of manufacturing. While agriculture relies on land, manufacturing production facilities can be relocated more easily. However, this does not explain the smaller impact on tradable services, which also have a high degree of mobility. The results also show that high-income and upper-middle-income countries experience a much larger decline in non-commodity exports (91 cents for every US dollar of commodity exports) than economically less developed countries (47 cents). This observation may be explained by the relatively stronger response of manufacturing to the increase in commodity exports as more developed countries have a higher share of manufacturing exports than lower-middle-income and low-income countries.

Other studies distinguish between different effects on different subsectors of manufacturing. Ismail (2010) examines the impact of oil price changes on manufacturing output in 90 countries. A 10% increase in oil prices is associated with a 3.4% decrease in industrial value added and a 3.6% decrease in industrial output. Within manufacturing, more capital-intensive industries are less affected by Dutch Disease than labor-intensive industries. The given explanation is that when the expanding non-tradable sector is labor-intensive, the factor prices of labor increase relative to the factor prices of rent implying a stronger impact on labor-intensive industries. The result of Bahar and Santos' panel analysis of manufacturing exports in 128 countries (2018) is in line with this finding, stating that labor-intensive products are most affected by the Dutch Disease. Their explanation is that when the price of capital is internationally fixed, a commodity price boom leads to an increase in domestic wages, which affects labor intensive industries the most. In contrast, examining firm-level data of the Chilean manufacturing sector, Heresi (2023) derives that capital-intensive firms suffer more from the Dutch Disease as the boom in the capital-intensive resource sector raises the relative price of capital.

Apart from the possible factors of tradability, labor or capital intensity, and mobility of a given sector, there is not much discussion of factors that might explain differences in the responses of different sectors to commodity price increases. Moreover, all these studies focus only on tradable sectors, while, to the best of my knowledge, there are no studies that focus on the differential impact on different non-tradable sectors.

2.4 Data

For the analysis of sector-specific Dutch Disease effects, data on sectoral value added is taken from the Economic Transformation Database (ETD) by de Vries et al. (2021). The ETD contains information on value added in twelve sectors: agriculture, mining, manufacturing, utilities, construction, trade services, transport services, business services, financial services, real estate, government services, and other services. The use of value added data follows some of the empirical literature in this field (e.g., Spatafora and Warner 1999; Amiri et al. 2019; K.-F. Chang et al. 2021) and has the advantages of, first, including non-tradable sectors that are not represented in export data. Second, value added is more precise than exports, as it refers directly to the economic activity in the sector. Meanwhile, export data face the problem of double counting, as they do not take into account possible re-exports and overestimate the importance of products that rely heavily on previous imports and include little domestic value added (Koopman et al. 2014; K.-F. Chang et al. 2021).

The sample of this study is limited to countries included in the ETD. These are 51 countries from Latin America, Asia and Africa. Four countries in the ETD were classified as high-income countries by the World Bank at the beginning of the observation period in 2000. These countries were excluded from the sample because their economic conditions are significantly different from those of lower-income countries.[6] The remaining 46 countries are listed in Appendix A.2 with their respective regional and income classifications. As defined by UNCTAD (2021), countries in the sample are classified as commodity-dependent if the share of commodities in their exports exceeds 60% in the base year 2000. Using the base year to classify countries avoids endogeneity problems that could arise if continuous classifications were applied over the entire observation period. In the country sample, 20 countries are classified as commodity dependent, and 26 countries are classified as non-commodity dependent.[7]

The twelve sectors are divided into tradable and non-tradable sectors, following the classification of Mano and Castillo (2015) (see Table 2.1). Their classification is based on the ratio of sector exports to sector value added for a sample of 56 countries over 16 years. If this ratio is greater than 10%, the sector is classified as tradable; if it is lower, it is non-tradable. In some cases, the ETD uses broader categories to classify economic sectors than Mano and Castillo (2015). Trade services include the categories of wholesale (tradable), retail trade (non-tradable), and hotels and restaurants (non-tradable). Two of the categories are classified as non-tradable by Mano and Castillo, while one is classified as tradable. Therefore, I consider trade services to be mostly non-tradable. For transport services, the subcategories land transport, air transport, water transport and supporting and auxiliary transport activities are all classified as tradable, while only post and telecommunications are classified as non-tradable. Consequently, transport services are classified as mostly tradable.

[6] In addition, Chinese Taipei was excluded from the sample because it is not a member of the World Bank and data for most variables are not available for Chinese Taipei.

[7] Data for this variable is taken from The Growth Lab At Harvard University (2019) SITC 2-digit-level (Rev. 2).

Table 2.1: Tradability of economic sectors, following Mano and Castillo (2015)

Sectors	**Tradable (T) / Non-tradable (N)**
Agriculture	T
Mining	T
Manufacturing	T
Business services	T
Financial services	T
Transport services	Mostly T
Trade services	Mostly N
Utilities	N
Construction	N
Real estate	N
Government services	N
Other services	N

Source: Elaboration by the author. Based on information from Mano and Castillo (2015).

An advantage of disaggregating and considering tradable services is that otherwise manufacturing would be the only non-commodity sector classified as tradable. Most studies of the Dutch Disease follow this approach. The inclusion of tradable services allows a better understanding of whether changes in commodity prices affect only the manufacturing sector or the entire tradable sector.

Table 2.2 shows the average shares of each sector in total value added and total employment. As expected, the share of agriculture is much higher in commodity dependent countries for both indicators. To compensate for the lower share of agriculture, the non-commodity-dependent countries have larger shares mainly in manufacturing, financial services (both indicators) and construction and government services (in employment). For the purposes of this study, it is important to emphasize that manufacturing is the most relevant non-resource tradable sector in commodity-dependent countries, but taken together, the other three sectors classified as tradable account for a larger share of value added and a similar share of employment. They therefore play a relevant role in these economies. The non-tradable sectors of trade services and government services also generate significant shares of value added and employment.

Table 2.2: Average shares of the sectors in total value added and total employment, in percent, 2000-2018

	Average share in total value added (in %)		Average share in total employment (in %)	
Sectors	Commodity dependent countries	Non-commodity dependent countries	Commodity dependent countries	Non-commodity dependent countries
Agriculture	21.02	11.78	49.2	29.73
Mining	6.00	4.73	0.78	0.64
Manufacturing	13.03	17.23	7.65	13.27
Business services	6.7	7.49	3.09	5.36
Financial services	3.63	5.32	0.65	1.84
Transport services	5.1	5.77	3.58	4.22
Trade services	14.86	15.65	15.61	17.81
Utilities	2.06	2.6	0.4	0.64
Construction	5.68	5.66	4.12	6.94
Real estate	6.32	6.51	0.13	0.68
Government services	12.52	13.35	8.08	12.49
Other services	3.04	3.92	6.71	6.4

Source: Elaboration by the author. Data from the Economic Transformation Database.

Commodity price developments for each country are captured by the IMF's Commodity Terms of Trade Index, which is described in more detail in Gruss and Kebhaj (2019). The index captures price developments for each country's specific commodity export products and accounts for changes in export composition over time by applying rolling weights. Commodity prices can be assumed to be exogenous for most countries and commodities (Gruss and Kebhaj 2019). Using them as explanatory variables significantly reduces endogeneity problems. In contrast, commodity revenues and commodity exports depend on the endogenous decision to increase or decrease extraction.

2.5 Methodology

The empirical analysis in this study is based on a panel of 46 countries and 19 years (2000 to 2018). For a dynamic panel such as this one, the Generalized Method of Moments (GMM) is a commonly used estimation technique. GMM estimators have the advantage of handling the potential endogeneity of all regressors and including fixed effects. They can also be applied to unbalanced panels. The system GMM of Blundell and Bond (1998) is the extension of the difference GMM developed by Arellano and Bond (1991). Bond et al. (2001) show that the System-GMM approach is more appropriate than the Difference-GMM for certain macroeconomic analyses. Behzadan et al. (2017) confirm this statement for the study of Dutch Disease effects by comparing the results of their Difference- and System-GMM estimations. For these reasons, following some of the recent literature in the field (e.g., Rajan and Subramanian 2008; Lartey 2011; Apergis et al. 2014; Behzadan et al. 2017; Anyanwu et al. 2021), I analyze panel data using the two-stage System-GMM estimator. A prerequisite for using this estimator is that the panel data are stationary and do not exhibit unit root behavior. Since some variables show a unit root behavior in levels, all variables are detrended by first differencing.[8]

The general estimation equation is:

$$y_{i,t} = \alpha + \delta\, y_{i,t-1} + \beta X'_{i,t} + \mu_i + v_{i,t} \qquad (2.1)$$

where $y_{i,t}$ is the dependent variable that is estimated by its lagged observations $y_{i,t-1}$. $X'_{i,t}$ is a vector of the included independent variables, α is the constant, and the error term is split into μ_i, representing the country-fixed effects and $v_{i,t}$ including the idiosyncratic shocks. $i = 1, \dots N$ and $t = 1, \dots T$ define the panel data by specifying the countries and the years (Roodman 2009b). Due to the relatively small sample size and the fact that the number of instruments must not exceed the number of countries to avoid the bias of too many instruments (Roodman 2009a), the number of lags of past observations to instrument potentially endogenous variables is limited to three (lagged

[8] The results of the Im-Pesaran-Shin unit root test (Im et al. 2003) for the variables in first differences are presented in Appendix A.3.

dependent variable and lagged sectoral productivity) and one (GDP growth rate and trade openness), respectively.

The dependent variable is the relative sectoral value added (RVA_j), which is calculated by dividing the share of sector j's value added (SVA_j) by the non-commodity value added of the economy:

$$RVA_j = \frac{SVA_j}{SVA_{total} - SVA_{agr} - SVA_{min}} \qquad (2.2)$$

Using not each sector's value added, but its value added relative to the rest of the economy, avoids sectoral performance being influenced by overall economic expansions or contractions. In contrast, only the shift between different sectors is captured, which is what lies at the center of the Dutch Disease theory. In this context, excluding the booming commodity sectors of mining and agriculture from total value added is crucial to avoid price-induced distortions. During the 2003-2013 commodity price boom, export prices for hydrocarbons increased by a factor of five, for precious metals by a factor of 5.8, for base metals by a factor of 4.5, and for agricultural products by a factor of 2.2 (IMF 2022). Thus, price rallies in these sectors would inflate the denominator and thereby reduce the share of value added in other sectors, even though their contribution to the economy would not decline.

In order to compare the sectorally differentiated results with commonly used more aggregated variables, the estimates are run not only for each of the ten economic sectors, but also, with the same specifications, for the ratio of manufacturing to services and the ratio of tradable to non-tradable sectors. The ratio of manufacturing to services is the most commonly used dependent variable for Dutch disease-related analyses (Brahmbhatt et al. 2010). In this case, it is calculated as the sectoral value added of manufacturing divided by the sum of the value added of trade services, transport services, business services, financial services, government services and other services:

$$man\_serv_{i,t} = \frac{SVA_{man,i,t}}{SVA_{tradesv+transpsv+bussv+finsv+govsv+othersv,i,t}} \qquad (2.3)$$

Following the reasoning of Mano and Castillo (2015), some of the service sectors are classified as tradable. A more aggregated view of value added in the categories of tradable and non-tradable sectors is obtained by dividing the sum of value added in manufacturing, financial services, business services, and transportation services by the sum of value added in trade services, utilities, construction, real estate, government services, and other services:

$$trade\_nontrade_{i,t} = \frac{SVA_{man+finsv+bussv+transpsv,i,t}}{SVA_{tradesv+uti+cons+realest+govsv+othersv,i,t}} \qquad (2.4)$$

In the baseline model, the growth rate of relative sectoral value added is estimated by its past growth rate, the growth rate of commodity prices, and the growth rate of GDP per capita as a proxy for productivity. To derive the effect of commodity price changes on sectoral value added in commodity-dependent countries as opposed to non-commodity-dependent countries, both a dummy for commodity dependence and an interaction term of this dummy with the commodity price growth rate are included. The results of the interaction term can be interpreted as the difference in the response to commodity price shocks in commodity-dependent countries compared to non-commodity-dependent countries. Using non-commodity-dependent countries as a control group isolates the specific effects on commodity-dependent countries, as other events that may be correlated with commodity price changes would also occur in non-commodity-dependent countries.[9] In addition, year dummies are included to control for time fixed effects. Robust standard errors are used in all estimations to control for heteroskedasticity. There are no missing data for this specification, which provides a fully balanced panel.

[9] For example, it could be argued that the commodity price boom was driven by rising global demand, which could bias the results but is captured by the comparison with the control group, which is also affected by rising demand.

The equation for the model can be described as:

$$\Delta RVA_{j,i,t} = f(\Delta RVA_{j,i,t-1}, \Delta gdp_{i,t}, \Delta compr_{i,t}, comdep_i, comdep_i * \Delta compr_{i,t}, yr^*) \tag{2.1}$$

j denominates the different sectors, ΔRVA is the growth rate of the relative share of the sector in total non-resource value added, Δgdp is the growth rate of GDP per capita, $\Delta compr$ is the growth rate of each country's commodity price index, $comdep$ is a dummy variable that takes the value of 1 if commodities account for more than 60% of the country's total exports in the base year 2000, yr are the included year dummies.

Productivity is chosen as a key variable in the baseline model because its increase enhances the competitiveness of the domestic economy, particularly benefiting tradable sectors that compete internationally. While the ideal indicator would be the ratio of consumer to producer prices (Poncela et al. 2017), data limitations necessitate the use of GDP per capita as a proxy, following previous studies (e.g., Amuedo-Dorantes and Pozo 2004; Korhonen and Juurikkala 2009; Bahar and Santos 2018). However, GDP per capita has drawbacks: it reflects overall economic activity, not sectoral productivity, and can inflate during commodity booms without reflecting real productivity gains. To address this, sectoral labor productivity (value added per worker) is used as an alternative in robustness tests. Sectoral employment and sectoral value added data from the ETD are combined to derive value added per worker. While GDP per capita captures cross-sectoral productivity effects, sectoral labor productivity only reflects productivity growth within a sector, leading to different interpretations.

In order to test the robustness of this model, control variables used in the literature are added to this specification. Trade openness, measured as the sum of exports and imports divided by GDP, indicates how open the country is to trade. For tradable sectors, a higher degree of trade openness could imply stronger international competition (N. Chen et al. 2009). Otherwise, it could mean that they have easier access to foreign markets due to export-friendly policies in their home country (Shafaeddin 1995). Therefore, the effect of trade openness on value added in tradable sectors could be positive or negative. Next, an increase in government expenditure as a share of GDP could benefit non-tradable sectors. A large share of government spending goes to construction and government services, both of which are classified as non-tradable (Ricci et al. 2008). Data for these two control variables are taken from the World Bank Open Data.

Two more control variables are added to proxy for circumstances under which Dutch Disease effects might be mitigated in the case of a commodity windfall. To capture this effect, these variables are added as interaction terms with the commodity price. Policies are difficult to include in a panel data analysis because they vary widely across countries. In the context of this study, capital account openness is used as a proxy for policy. When governments reduce capital account openness, they limit capital inflows from the commodity windfall (Rodrik and Velasco 2000). Thereby, they reduce the spending effect and the appreciation of the real exchange rate. Consequently, lower capital account openness should lead to less negative effects on the tradable sector when commodity prices rise. The data for this variable are taken from the Chinn-Ito Index (Chinn and Ito 2006). The other interacted control variable is institutional quality. As Amiri et al. (2019) show, institutional quality helps to mitigate the Dutch Disease effect in the event of commodity windfalls. It is expected that a relative decline in tradable sectors is less likely to occur when institutional quality is higher. The institutional quality index is constructed by averaging the six indicators of different aspects of institutional quality included in the Worldwide Governance Indicators (Kaufmann et al. 2010).

Income level dummies (low-income, lower-middle-income, upper-middle-income) are included to account for heterogeneity in the level of development of countries. The lagged commodity price growth rate is included as an additional explanatory variable, as the effects of changes in commodity prices may manifest themselves with a lag. Repeating the model with the addition of each of these variables tests its robustness. At the same time, some of the control variables make the panel unbalanced. Some observations for government expenditure, institutions and trade openness are missing for some countries. In addition, one country has to be dropped in two specifications. However, the number of missing observations is relatively small, so the results should still be comparable to those of the baseline model.

The Arellano-Bond test for AR (2) and the Hansen J test are performed to test whether the results of the two-stage system GMM estimation are econometrically reliable. The former tests for auto-correlation. Its null hypothesis is that there is no second-order serial correlation (Arellano and Bond 1991). The Hansen J test controls for model overspecification and the exogeneity of all instruments. If the null hypothesis that all instruments are exogenous is rejected, the results are invalid. On the other hand, the chi-square value for the Hansen test should not be too close to one. This would indicate that too many instruments may have inflated the value of the Hansen test. In this case, the test results are unreliable (Roodman 2009a). However, there is no precise critical value that indicates that the value of the Hansen test is too high. The difficulty for this study is that the same estimation is applied to ten to twelve different dependent variables. While autocorrelation can be ruled out in all cases, in some cases the Hansen test values for individual estimations are very high (and in rare cases too low). This casts doubt on the exogeneity of the instruments and the model identification. However, using the same equation for all dependent variables is preferable to having more reliable Hansen test values in individual cases. The results of estimations where the Hansen test is close to one should be interpreted with caution.

2.6 Results

Table 2.3: Baseline model[10]

VARIABLES	(1) ΔMan/Serv	(2) ΔTrade/Non-trade	(3) ΔManufacturing	(4) ΔBusiness Services	(5) ΔFinancial Services	(6) ΔTransport Services
ΔL.DepVar	0.140**	0.102*	0.165***	0.071	-0.021	-0.034
	(0.066)	(0.051)	(0.051)	(0.056)	(0.070)	(0.065)
ΔComPrice	0.157**	0.213**	0.284**	-0.120	-0.257	0.065
	(0.069)	(0.095)	(0.129)	(0.213)	(0.247)	(0.132)
ComDep	0.088	-0.305	0.255	-1.515**	-0.815	0.560
	(0.195)	(0.227)	(0.414)	(0.702)	(1.069)	(0.421)
ΔComPrice*ComDep	-0.187***	-0.226**	-0.343***	0.202	-0.079	-0.078
	(0.062)	(0.094)	(0.103)	(0.200)	(0.260)	(0.156)
ΔGDP	0.259***	0.181**	0.516***	-0.492***	-0.385	0.017
	(0.067)	(0.089)	(0.150)	(0.113)	(0.413)	(0.099)
Observations	872	872	872	872	872	872
Number of idnr	46	46	46	46	46	46
F	6.426	9.119	10.03	7.700	8.895	2.220
F_p	5.85e-08	2.24e-10	0	3.57e-09	3.40e-10	0.0110
ar2p	0.771	0.984	0.315	0.287	0.854	0.0925
hansenp	0.422	0.547	0.297	0.439	0.592	0.317

VARIABLES	(7) ΔUtilities	(8) ΔConstruction	(9) ΔTrade Services	(10) ΔReal Estate	(11) ΔGovernment Services	(12) ΔOther Services
ΔL.DepVar	0.023	0.071	0.091**	-0.109	-0.011	-0.079***
	(0.057)	(0.063)	(0.038)	(0.080)	(0.070)	(0.025)
ΔComPrice	0.145	-0.626***	-0.178	0.402	0.032	-0.399
	(0.553)	(0.187)	(0.147)	(0.352)	(0.251)	(0.243)
ComDep	-0.006	2.296***	0.529	-2.190**	-0.124	-1.729*
	(0.956)	(0.691)	(0.371)	(1.066)	(0.465)	(0.953)
ΔComPrice*ComDep	-0.151	0.472***	0.267*	0.015	0.009	0.114
	(0.560)	(0.173)	(0.142)	(0.398)	(0.242)	(0.242)
ΔGDP	-0.241	0.758**	0.240*	-0.521*	-0.476***	-0.259
	(0.220)	(0.340)	(0.131)	(0.285)	(0.159)	(0.315)
Observations	872	872	872	872	872	872
Number of idnr	46	46	46	46	46	46
F	3.095	6.645	7.501	19.78	6.765	5.211
F_p	0.000586	3.53e-08	5.41e-09	0	2.69e-08	1.18e-06
ar2p	0.332	0.0923	0.952	0.336	0.665	0.630
hansenp	0.470	0.151	0.900	0.232	0.242	0.100

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

[10] In all results, the values for the intercept and the year dummies are suppressed.

Table 2.3 shows the results for the baseline model, in which the effect of the commodity price on relative sectoral value added is estimated by adding GDP per capita as a proxy for productivity. The interaction term of the commodity price with the commodity dependence dummy indicates the effect of commodity price changes in commodity-dependent countries in contrast to non-commodity dependent countries. An increase in the commodity price leads to a significantly larger reduction in the ratio of manufacturing to services (99% confidence level) and the ratio of tradables to non-tradables (95% confidence level) in commodity-dependent countries than in non-commodity-independent countries. A one percentage point increase in the explanatory variable reduces these two dependent variables by approximately 0.19 and 0.23 percentage points relative to the effect in non-commodity dependent countries. This result confirms the expected outcome of the Dutch Disease theory. Looking at the more disaggregated results, however, it becomes clear that the different tradable sectors do not react homogeneously to an increase in the growth rate of commodity prices. While the relative growth rate of manufacturing is adversely affected at the one percent significance level, with a decline that is 0.34 percentage points larger than in non-commodity dependent countries, financial, business and transport services show no significant reaction. The results for non-tradable sectors are also mixed. The relative growth rate of construction reacts strongly and positively to a one percentage point increase in the growth rate of commodity prices, increasing by 0.47 percentage points more than in non-resource-dependent countries (1% significance level). Among the other non-tradable sectors, only trade services respond significantly (at the 10% significance level) with an increase of 0.26 percentage points.[11]

The dummy for commodity dependence indicates that commodity dependent countries differ from non-commodity dependent countries in their economic development over the observation period. The former countries experience a much higher relative growth of the construction sector, with the growth rate being 2.3 percentage points higher than in non-commodity dependent countries. On the other hand, the growth rate for business services, real estate and other services is significantly higher in non-commodity dependent countries.

[11] For this specification, the result for trade services should be interpreted with caution due to its high Chi-square value in the Hansen test.

The result tables for specifications with additional control variables can be found in Appendix A.3. Table 2.4 adds trade openness as a control variable. The results remain very similar to the baseline model. Trade openness itself only has a significant negative effect on the relative growth rate of the financial sector. The result could be interpreted in the sense that the financial sector suffers from the increased international competition that results from greater trade openness.

An increase in government expenditure is expected to benefit mainly the non-tradable sectors of government services and construction. Indeed, Table 2.5 shows that government spending has a relatively large and significant positive effect on the relative growth rate of government services (0.35 percentage points), but no significant effect on construction. Among tradable sectors, it has a significant negative effect on the growth rate of manufacturing (-0.32 percentage points). It also has a small but significant negative effect on the growth rate of the ratio of manufacturing to services (-0.15 percentage points). The results continue to be comparable to the baseline model in terms of sign, magnitude, and significance.[12] The addition of capital account openness (Table 2.6), institutional quality (Table 2.7) [13] and the lagged commodity price and income classification dummies (Table 2.8)[14] do not change the results of the baseline model.

In the final specification, GDP per capita is replaced by lagged sectoral labor productivity as a proxy for productivity growth. As described in the section 2.5, this variable does not allow the estimation of the ratio of manufacturing to services and the ratio of tradable to non-tradable goods. The results in Table 2.9 demonstrate that it is the only specification with major changes in the effect of the growth rate of commodity prices in commodity dependent countries in comparison to non-commodity dependent countries. The effect on construction falls from 0.47 to 0.25 percentage

[12] Due to a very low value in the Hansen test, the results of this model should not be interpreted for real estate.

[13] Due to a very low value in the Hansen test, the results of this model should not be interpreted for real estate. In addition, the results for manufacturing to services, manufacturing and trade services should be interpreted with caution due to very high values in the Hansen test.

[14] Due to a very low value in the Hansen test, the results of this model should not be interpreted for other services. In addition, the results for trade services should be interpreted with caution due to very high values in the Hansen test.

points and loses significance. For trade services, the effect of commodity price changes in commodity dependent countries increases from 0.27 to 0.37 and becomes significant at the 5% level (previously at the 10% level). However, the main trend remains robust.

2.7 Discussion

The aggregate results for the ratio of manufacturing to services and for the ratio of tradable to non-tradable sectors suggest that tradable sectors generally decline relative to non-tradable sectors. However, the more disaggregated sectoral view suggests that this effect is mainly concentrated in manufacturing and construction/trade services. In all specifications of the estimation, manufacturing is negatively affected by rising commodity prices in commodity dependent countries in comparison to non-commodity dependent countries. At the same time, construction (in all but one specification) and trade services in commodity dependent countries benefit from commodity price increases compared to non-commodity dependent countries. The magnitudes of these effects are economically relevant as, in comparison to non-commodity dependent countries, the relative growth rate of manufacturing reacts with a 0.34 percentage point decrease and the relative growth rates of construction and trade services with a 0.47 and 0.26 percentage point increase, respectively, to a one percentage point increase in the commodity price growth rate in commodity dependent countries. Other tradable and non-tradable sectors do not experience significant changes. This raises the question of how these sectors differ from other tradable and non-tradable sectors.

One possible explanation for why construction is positively affected by commodity price increases is that a substantial share of commodity revenues is spent by the government. Governments receive commodity revenues through taxes, royalties, and state-owned enterprises and thus benefit from commodity price booms (Gómez Sabaíni et al. 2015). In general, governments tend to spend a large share of their expenditures on construction and government services (Ricci et al. 2008). Therefore, it is not surprising that higher revenues from resource windfalls are channeled through the government to the construction sector. However, this argument does not explain why there is no positive effect of rising commodity prices on the government services sector. Another possible explanation for the positive response of the construction sector stems from political interests: when a commodity price boom takes place, the population expects to benefit from this boom. Therefore, the government may have an incentive to spend some of the revenues in a way that the population notices the benefits (Gupta and Miranda 1991; Paldam 2013). Construction is a highly visible sector that produces tangible change relatively quickly. Therefore, from a popularity perspective, the government may prefer to invest in the construction sector rather than in other sectors that may be less visible. In addition, private actors can also contribute to the construction sector's upswing. Compared to other sectors, the construction sector is more sensitive to boom and bust cycles because investments in this sector involve relatively high costs (e.g., building a house) that are more likely to be financed during boom times (Pheng and Hou 2019). During a commodity price boom, income flows into the country facilitate these high-cost investments in the construction sector.

The particularly positive effect in the trade services sector could be due to the increased demand for goods and services in the commodity sector, which is channeled through wholesale and retail outlets and thus directly affects the trade services sector. Wholesalers and retailers also benefit from the generally higher trade volumes resulting from the boom, including both higher (commodity) exports and higher imports (to meet the increased demand). In addition, the windfall profits are likely to increase the incomes of the richer parts of the population (shareholders in the extractive industries, workers in the relatively high-paying extractive industries). These upper parts of the income distribution are likely to spend more of their increased income on luxury services, such as hotels and restaurants (Behzadan et al. 2017), thereby increasing demand for these parts of the trade services sector.

With respect to manufacturing, Harding and Venables (2016) explain that it is more mobile than agricultural production and can therefore more easily relocate to other countries. This possible relocation implies a stronger negative reaction to changes in commodity prices. However, this explanation does not hold for the results of this study. Financial services, business services and transport services, which are the other tradable sectors included in this study, are all likely to have a higher degree of mobility than manufacturing, as they require less machinery and sophisticated production facilities. A more plausible explanation might be that a larger share of the goods produced in manufacturing are tradable. All observed sectors represent the aggregation of different industries whose products and services are not equally likely to be traded. In the assessment of tradability by Mano and Castillo (2015), the five industries with the highest degree of tradability are all part of the manufacturing sector. Consequently, it could be that manufacturing has a higher degree of tradability than the other tradable sectors and is therefore the only sector negatively affected by Dutch Disease effects.

Beyond this possible explanation, however, the results of this study show that the tradable sector does not react homogeneously to commodity price increases. Still, the Dutch Disease model works with the simplified assumption that manufacturing represents the whole tradable sector. This assumption is adopted by empirical studies, which focus almost exclusively on the analysis of the manufacturing sector. Therefore, both theory and empirics might overestimate the effects of Dutch Disease. The results for the only sector that is significantly adversely affected by the Dutch Disease are extrapolated to several other sectors which are themselves not negatively affected by rising commodity prices.

2.8 Conclusion

This chapter examines the sectorally differentiated effects of commodity price increases from 2000 to 2018. With the commodity price boom from 2003 to 2013, this period contains the most pronounced commodity price increase to date. The main novelty of the chapter is the focus on ten different economic sectors in developing economies. This allows us to examine specific effects on different tradable and non-tradable sectors. Confirming other studies and the Dutch Disease theory, a significant and negative effect of commodity price increases on the growth rate of the manufacturing sector is found in commodity dependent countries, compared to non-commodity dependent countries. However, the estimations point out that manufacturing is the only one out of four tradable sectors that is negatively affected by commodity price increases, while the theory of the Dutch Disease would predict a homogeneous decline of all tradable sectors. In addition, construction and trade services are the only of six non-tradable sectors to benefit significantly from the rise in commodity prices. A comparison of these disaggregated results with the more general results for the ratio of manufacturing to services and the ratio of tradables to non-tradables highlights the advantages of taking a disaggregated view. The commonly used aggregated classifications indicate that the whole tradable sector suffers from Dutch Disease phenomena in the case of a commodity price boom. However, the sectorally differentiated results provide the insight that these results might overestimate Dutch Disease effects as the particularly adverse results for manufacturing are extrapolated to other sectors which themselves do not suffer from Dutch Disease. As most of the literature in this field focuses only on the manufacturing sector, the results of this chapter question the reliability of these studies in providing information about Dutch Disease effects on the tradable sector.

While this chapter offers some initial thoughts on possible explanations for the differentiated responses of individual sectors within the tradable and non-tradable sectors, it would be important to study the reasons for these differentiated results in more detail in order to better understand the mode of action of the Dutch Disease. The results of this chapter suggest that the simple distinction between tradable and non-tradable sectors is not sufficient to explain how sectors react to a commodity windfall.

Furthermore, it would be interesting to further disaggregate the individual sectors to obtain more information about which industries or services are particularly affected by Dutch Disease effects. Ismail (2010) provides this analysis for eight different industries within the manufacturing sector, but it would also be promising to gain more knowledge at the industry level from other sectors.

Appendix A

Appendix A.1

Table 2.4: Baseline model with trade openness

VARIABLES	(1) ΔMan/Serv	(2) ΔTrade/Non-trade	(3) ΔManufactur-ing	(4) ΔBusiness Ser-vices	(5) ΔFinancial Ser-vices	(6) ΔTransport Services
ΔL.DepVar	0.104*	0.065	0.136**	0.064	0.088	0.026
	(0.061)	(0.054)	(0.057)	(0.051)	(0.086)	(0.059)
ΔComPrice	0.149**	0.213**	0.269**	-0.171	-0.096	0.049
	(0.062)	(0.089)	(0.104)	(0.202)	(0.210)	(0.134)
ComDep	0.092	-0.393	0.126	-1.381**	-2.459**	0.480
	(0.190)	(0.235)	(0.376)	(0.633)	(1.169)	(0.426)
ΔComPrice*ComDep	-0.194***	-0.233**	-0.386***	0.226	-0.114	-0.070
	(0.062)	(0.104)	(0.103)	(0.187)	(0.270)	(0.163)
ΔGDP	0.274***	0.141	0.489***	-0.489***	-0.849*	0.014
	(0.070)	(0.091)	(0.159)	(0.118)	(0.482)	(0.112)
ΔTrade_openness	0.019	0.024	0.061	0.016	-0.313**	0.047
	(0.017)	(0.027)	(0.040)	(0.075)	(0.118)	(0.048)
Observations	831	831	831	831	831	831
Number of idnr	45	45	45	45	45	45
F	6.818	9.990	10.71	17.26	7.371	3.015
F_p	2.41e-08	5.15e-11	0	0	7.29e-09	0.000736
ar2p	0.814	0.800	0.354	0.323	0.301	0.0589
hansenp	0.685	0.550	0.385	0.799	0.467	0.284

VARIABLES	(7) ΔUtilities	(8) ΔConstruction	(9) ΔTrade Ser-vices	(10) ΔReal Estate	(11) ΔGovernment Services	(12) ΔOther Services
ΔL.DepVar	0.028	0.049	0.088**	-0.134	-0.086	-0.079***
	(0.058)	(0.057)	(0.042)	(0.088)	(0.084)	(0.018)
ΔComPrice	0.265	-0.633***	-0.184	0.452	0.152	-0.398*
	(0.560)	(0.176)	(0.136)	(0.349)	(0.233)	(0.223)
ComDep	0.534	2.216***	0.418	-2.701***	-0.102	-1.650*
	(0.970)	(0.670)	(0.364)	(0.895)	(0.508)	(0.886)
ΔComPrice*ComDep	-0.321	0.468***	0.262*	0.037	-0.096	0.096
	(0.536)	(0.161)	(0.130)	(0.437)	(0.223)	(0.223)
ΔGDP	-0.253	0.725**	0.220	-0.345	-0.482***	-0.292
	(0.214)	(0.357)	(0.159)	(0.327)	(0.155)	(0.296)
ΔTrade_openness	0.014	0.000	-0.043	-0.140	-0.015	0.051
	(0.114)	(0.072)	(0.035)	(0.190)	(0.064)	(0.065)
Observations	831	831	831	831	831	831
Number of idnr	45	45	45	45	45	45
F	3.773	5.866	9.658	14.56	5.491	5.748
F_p	6.70e-05	2.22e-07	9.13e-11	0	5.64e-07	2.96e-07
ar2p	0.342	0.0796	0.939	0.341	0.918	0.915
hansenp	0.418	0.438	0.651	0.466	0.168	0.293

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.5: Baseline model with government expenditure

VARIABLES	(1) ΔMan/Serv	(2) ΔTrade/Non-trade	(3) ΔManufacturing	(4) ΔBusiness Services	(5) ΔFinancial Services	(6) ΔTransport Services
ΔL.DepVar	0.155***	0.073	0.162***	0.049	0.017	-0.016
	(0.053)	(0.057)	(0.055)	(0.051)	(0.102)	(0.076)
ΔComPrice	0.165**	0.208**	0.295**	-0.142	-0.284	0.085
	(0.072)	(0.094)	(0.134)	(0.218)	(0.291)	(0.147)
ComDep	0.112	-0.292	0.099	-1.447**	-0.627	0.519
	(0.194)	(0.196)	(0.366)	(0.715)	(0.976)	(0.451)
ΔComPrice*ComDep	-0.212***	-0.247**	-0.401***	0.178	-0.020	-0.095
	(0.070)	(0.102)	(0.118)	(0.211)	(0.317)	(0.178)
ΔGDP	0.277***	0.171*	0.463***	-0.471***	-0.578	-0.018
	(0.073)	(0.092)	(0.155)	(0.152)	(0.437)	(0.106)
ΔGovernment_Expenditure	-0.147**	-0.109	-0.323**	0.157	0.264	-0.168
	(0.063)	(0.067)	(0.157)	(0.396)	(0.307)	(0.168)
Observations	809	809	809	809	809	809
Number of idnr	45	45	45	45	45	45
F	18.60	6.722	12.00	14.66	10.84	6.321
F_p	0	2.99e-08	0	0	0	7.49e-08
ar2p	0.737	0.917	0.217	0.198	0.515	0.119
hansenp	0.349	0.570	0.230	0.549	0.748	0.274

VARIABLES	(7) ΔUtilities	(8) ΔConstruction	(9) ΔTrade Services	(10) ΔReal Estate	(11) ΔGovernment Services	(12) ΔOther Services
ΔL.DepVar	0.013	0.013	0.077*	-0.186**	0.018	-0.069***
	(0.055)	(0.060)	(0.043)	(0.089)	(0.132)	(0.012)
ΔComPrice	0.076	-0.669***	-0.199	0.205	0.222	-0.371
	(0.639)	(0.182)	(0.166)	(0.476)	(0.176)	(0.274)
ComDep	0.333	2.161***	0.404	-2.299*	-0.067	-1.111
	(0.981)	(0.692)	(0.338)	(1.152)	(0.444)	(0.894)
ΔComPrice*ComDep	-0.062	0.441**	0.326**	0.040	-0.162	0.034
	(0.640)	(0.188)	(0.150)	(0.662)	(0.174)	(0.280)
ΔGDP	-0.374	0.715**	0.241*	-0.551	-0.495***	-0.029
	(0.256)	(0.344)	(0.142)	(0.422)	(0.155)	(0.349)
ΔGovernment_Expenditure	-0.627	-0.201	-0.043	-0.126	0.349**	-0.171
	(0.528)	(0.266)	(0.139)	(0.316)	(0.171)	(0.289)
Observations	809	809	809	809	809	809
Number of idnr	45	45	45	45	45	45
F	3.943	4.421	8.681	23.95	9.251	4.861
F_p	4.00e-05	9.95e-06	5.36e-10	0	1.88e-10	2.93e-06
ar2p	0.355	0.0783	0.926	0.297	0.622	0.670
hansenp	0.377	0.385	0.764	0.00423	0.199	0.242

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.6: Baseline model with capital account openness

VARIABLES	(1) ΔMan/Serv	(2) ΔTrade/Non-trade	(3) ΔManufacturing	(4) ΔBusiness Services	(5) ΔFinancial Services	(6) ΔTransport Services
ΔL.DepVar	0.140**	0.102*	0.165***	0.072	-0.020	-0.034
	(0.065)	(0.051)	(0.051)	(0.058)	(0.068)	(0.065)
ΔComPrice	0.159*	0.211*	0.273	-0.239	0.028	0.063
	(0.081)	(0.110)	(0.163)	(0.239)	(0.330)	(0.166)
ComDep	0.088	-0.304	0.254	-1.520**	-0.790	0.554
	(0.195)	(0.227)	(0.416)	(0.710)	(1.063)	(0.424)
ΔComPrice*ComDep	-0.186***	-0.227**	-0.351***	0.162	0.070	-0.070
	(0.064)	(0.099)	(0.106)	(0.192)	(0.285)	(0.161)
ΔGDP	0.259***	0.182**	0.515***	-0.501***	-0.366	0.015
	(0.066)	(0.088)	(0.148)	(0.115)	(0.413)	(0.097)
ΔComPrice*KA_Openness	-0.003	0.003	0.030	0.284	-0.735	0.000
	(0.085)	(0.132)	(0.188)	(0.259)	(0.621)	(0.337)
Observations	872	872	872	872	872	872
Number of idnr	46	46	46	46	46	46
F	7.741	8.627	10.36	7.732	7.078	2.218
F_p	2.59e-09	4.39e-10	0	2.64e-09	1.07e-08	0.0104
ar2p	0.771	0.985	0.318	0.299	0.893	0.0922
hansenp	0.422	0.547	0.297	0.433	0.608	0.316

VARIABLES	(7) ΔUtilities	(8) ΔConstruction	(9) ΔTrade Services	(10) ΔReal Estate	(11) ΔGovernment Services	(12) ΔOther Services
ΔL.DepVar	0.023	0.071	0.091**	-0.108	-0.010	-0.079***
	(0.057)	(0.063)	(0.038)	(0.080)	(0.071)	(0.025)
ΔComPrice	0.074	-0.579***	-0.179	-0.002	0.115	-0.452
	(0.634)	(0.204)	(0.165)	(0.379)	(0.262)	(0.277)
ComDep	0.004	2.302***	0.528	-2.186**	-0.109	-1.732*
	(0.955)	(0.695)	(0.374)	(1.055)	(0.461)	(0.955)
ΔComPrice*ComDep	-0.243	0.496**	0.267*	-0.235	0.051	0.068
	(0.570)	(0.210)	(0.135)	(0.342)	(0.248)	(0.309)
ΔGDP	-0.232	0.762**	0.240*	-0.569**	-0.468***	-0.264
	(0.219)	(0.344)	(0.132)	(0.277)	(0.159)	(0.316)
ΔComPrice*KA_Openness	0.232	-0.114	0.001	1.133	-0.216	0.121
	(0.688)	(0.318)	(0.243)	(0.912)	(0.284)	(0.373)
Observations	872	872	872	872	872	872
Number of idnr	46	46	46	46	46	46
F	2.835	6.643	7.012	19.57	6.686	5.324
F_p	0.00125	2.85e-08	1.24e-08	0	2.58e-08	7.26e-07
ar2p	0.332	0.0917	0.952	0.337	0.673	0.639
hansenp	0.468	0.151	0.900	0.241	0.236	0.102

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.7: Baseline model with institutional quality

VARIABLES	(1) ΔMan/Serv	(2) ΔTrade/Non-trade	(3) ΔManufacturing	(4) ΔBusiness Services	(5) ΔFinancial Services	(6) ΔTransport Services
ΔL.DepVar	0.239***	0.149***	0.151***	0.103	0.104	0.002
	(0.041)	(0.051)	(0.051)	(0.102)	(0.122)	(0.065)
ΔComPrice	0.126*	0.202**	0.234**	-0.136	-0.021	0.074
	(0.065)	(0.084)	(0.113)	(0.234)	(0.278)	(0.119)
ComDep	0.110	-0.263	0.403	-1.799***	-0.620	0.511
	(0.162)	(0.205)	(0.348)	(0.537)	(1.132)	(0.417)
ΔComPrice*ComDep	-0.162***	-0.186**	-0.301***	0.254	-0.173	-0.082
	(0.059)	(0.085)	(0.095)	(0.220)	(0.360)	(0.150)
ΔGDP	0.277***	0.195**	0.588***	-0.548***	-0.167	0.046
	(0.058)	(0.095)	(0.121)	(0.152)	(0.384)	(0.144)
ΔComPrice*Institutions	0.020	0.089**	0.062	-0.072	0.117	-0.013
	(0.037)	(0.036)	(0.081)	(0.142)	(0.346)	(0.088)
Observations	826	826	826	826	826	826
Number of idnr	46	46	46	46	46	46
F	12.86	7.287	12.03	7.713	10.43	4.809
F_p	0	8.53e-09	0	3.48e-09	0	3.45e-06
ar2p	0.415	0.956	0.265	0.209	0.870	0.0642
hansenp	0.974	0.720	0.828	0.272	0.105	0.145

VARIABLES	(7) ΔUtilities	(8) ΔConstruction	(9) ΔTrade Services	(10) ΔReal Estate	(11) ΔGovernment Services	(12) ΔOther Services
ΔL.DepVar	-0.042	0.079	0.106***	-0.218**	-0.034	-0.121*
	(0.027)	(0.061)	(0.036)	(0.081)	(0.137)	(0.062)
ΔComPrice	0.037	-0.683***	-0.127	0.009	0.020	-0.218
	(0.554)	(0.185)	(0.142)	(0.430)	(0.307)	(0.269)
ComDep	-0.196	2.237***	0.558	-2.683**	-0.047	-1.010
	(0.819)	(0.717)	(0.344)	(1.116)	(0.662)	(0.846)
ΔComPrice*ComDep	-0.023	0.462**	0.295**	-0.056	0.038	0.001
	(0.587)	(0.173)	(0.133)	(0.562)	(0.291)	(0.235)
ΔGDP	-0.133	0.820**	0.283**	-0.668*	-0.615***	-0.284
	(0.210)	(0.349)	(0.125)	(0.376)	(0.183)	(0.178)
ΔComPrice*Institutions	-0.637**	-0.209**	0.140*	-0.067	-0.039	0.001
	(0.311)	(0.083)	(0.075)	(0.345)	(0.167)	(0.088)
Observations	826	826	826	826	826	826
Number of idnr	46	46	46	46	46	46
F	3.449	9.797	11.28	6.733	16.02	2.632
F_p	0.000189	6.65e-11	0	2.89e-08	0	0.00272
ar2p	0.367	0.504	0.288	0.282	0.381	0.256
hansenp	0.501	0.442	0.960	0.0174	0.349	0.273

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.8: Baseline model with lagged commodity prices and income dummies

VARIABLES	(1) ΔMan/Serv	(2) ΔTrade/Non-trade	(3) ΔManufacturing	(4) ΔBusiness Services	(5) ΔFinancial Services	(6) ΔTransport Services
ΔL.DepVar	0.128*	0.104**	0.156***	0.079	-0.021	-0.034
	(0.071)	(0.051)	(0.053)	(0.064)	(0.068)	(0.065)
ΔComPrice	0.135**	0.201**	0.259**	-0.151	-0.254	0.046
	(0.066)	(0.090)	(0.122)	(0.216)	(0.231)	(0.130)
ComDep	0.161	-0.294	0.374	-2.181***	-1.135	0.610
	(0.226)	(0.271)	(0.495)	(0.809)	(1.257)	(0.435)
ΔComPrice*ComDep	-0.176***	-0.218**	-0.340***	0.212	-0.067	-0.062
	(0.060)	(0.090)	(0.097)	(0.201)	(0.259)	(0.154)
ΔL.ComPrice	-0.043	-0.118	0.057	0.013	-0.467	-0.160
	(0.092)	(0.097)	(0.190)	(0.366)	(0.344)	(0.126)
ΔL.ComPrice*ComDep	0.012	0.127	-0.082	0.451	0.145	0.141
	(0.087)	(0.093)	(0.179)	(0.316)	(0.338)	(0.152)
ΔGDP	0.256***	0.172*	0.522***	-0.520***	-0.356	0.016
	(0.069)	(0.088)	(0.156)	(0.115)	(0.422)	(0.101)
LIC_Dummy	-0.212	-0.113	-0.283	1.738	1.271	-0.258
	(0.249)	(0.319)	(0.627)	(1.068)	(1.731)	(0.303)
LMIC_Dummy	-0.267	-0.243	-0.472	1.620**	0.098	-0.598
	(0.292)	(0.270)	(0.520)	(0.751)	(1.001)	(0.478)
Observations	870	870	870	870	870	870
Number of idnr	46	46	46	46	46	46
F	7.085	9.087	15.81	18.10	14.09	2.947
F_p	5.71e-09	9.18e-11	0	0	0	0.000655
ar2p	0.814	0.981	0.331	0.275	0.732	0.0918
hansenp	0.332	0.646	0.262	0.344	0.596	0.324

VARIABLES	(7) ΔUtilities	(8) ΔConstruction	(9) ΔTrade Services	(10) ΔReal Estate	(11) ΔGovernment Services	(12) ΔOther Services
ΔL.DepVar	0.024	0.073	0.089**	-0.106	-0.005	-0.080***
	(0.058)	(0.068)	(0.039)	(0.081)	(0.064)	(0.026)
ΔComPrice	0.116	-0.667***	-0.179	0.397	0.033	-0.363
	(0.536)	(0.186)	(0.142)	(0.351)	(0.246)	(0.252)
ComDep	-0.383	2.288**	0.718	-2.718**	-0.399	-1.683
	(0.973)	(0.867)	(0.443)	(1.294)	(0.504)	(1.074)
ΔComPrice*ComDep	-0.154	0.493***	0.269*	0.096	0.028	0.094
	(0.548)	(0.170)	(0.137)	(0.428)	(0.239)	(0.252)
ΔL.ComPrice	0.270	-0.405	0.085	-0.075	0.200	0.447
	(0.381)	(0.285)	(0.181)	(0.224)	(0.379)	(0.404)
ΔL.ComPrice*ComDep	0.682	0.335	-0.005	-0.175	-0.290	-0.435
	(0.610)	(0.258)	(0.175)	(0.261)	(0.325)	(0.345)
ΔGDP	-0.276	0.756**	0.241*	-0.527*	-0.462***	-0.263
	(0.209)	(0.356)	(0.129)	(0.298)	(0.170)	(0.333)
LIC_Dummy	0.968	-0.452	-0.788	2.344	1.238**	-0.076
	(1.245)	(1.051)	(0.526)	(1.569)	(0.555)	(0.961)
LMIC_Dummy	0.226	-0.895	-0.832*	1.914**	0.869	-0.283
	(1.302)	(0.985)	(0.422)	(0.923)	(0.731)	(0.664)
Observations	870	870	870	870	870	870

Number of idnr	46	46	46	46	46	46
F	3.256	6.591	10.21	13.26	7.820	5.638
F_p	0.000227	1.79e-08	0	0	1.15e-09	1.90e-07
ar2p	0.339	0.109	0.959	0.339	0.696	0.591
hansenp	0.454	0.116	0.882	0.210	0.224	0.0744

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.9: Baseline model with lagged sectoral labor productivity instead of GDP

VARIABLES	(1) ΔManufacturing	(2) ΔBusiness Services	(3) ΔFinancial Services	(4) ΔTransport Services	(5) ΔUtilities
ΔL.DepVar	0.225***	0.175**	-0.029	-0.073	-0.018
	(0.060)	(0.077)	(0.084)	(0.066)	(0.040)
ΔComPrice	0.304*	-0.143	-0.220	0.025	0.119
	(0.159)	(0.219)	(0.271)	(0.140)	(0.533)
ComDep	-0.306	-1.405**	-0.482	0.682*	0.386
	(0.325)	(0.597)	(0.965)	(0.388)	(0.915)
ΔComPrice*ComDep	-0.328**	0.257	-0.093	-0.057	-0.117
	(0.127)	(0.201)	(0.271)	(0.163)	(0.544)
ΔL.DepSector_Productivity	-0.264*	0.020	-0.031	0.206*	0.038
	(0.135)	(0.082)	(0.103)	(0.116)	(0.030)
Observations	872	872	872	872	872
Number of idnr	46	46	46	46	46
F	9.240	8.136	9.429	4.426	2.827
F_p	1.80e-10	1.47e-09	1.28e-10	1.01e-05	0.00141
ar2p	0.246	0.0761	0.697	0.144	0.327
hansenp	0.593	0.341	0.815	0.349	0.497

VARIABLES	(6) ΔConstruction	(7) ΔTrade Services	(8) ΔReal Estate	(9) ΔGovernment Services	(10) ΔOther Services
ΔL.DepVar	-0.369	0.070	-0.143*	-0.022	-0.078***
	(0.395)	(0.054)	(0.078)	(0.077)	(0.025)
ΔComPrice	-0.486*	-0.274	0.404	0.050	-0.349
	(0.253)	(0.174)	(0.407)	(0.228)	(0.275)
ComDep	2.267**	0.234	-1.257	0.291	-1.532*
	(1.015)	(0.301)	(0.906)	(0.462)	(0.904)
ΔComPrice*ComDep	0.253	0.375**	0.299	-0.003	0.126
	(0.220)	(0.167)	(0.461)	(0.233)	(0.274)
ΔL.DepSector_Productivity	1.679	-0.051	-0.000	0.256	-0.014
	(1.677)	(0.061)	(0.000)	(0.264)	(0.245)
Observations	872	872	805	872	872
Number of idnr	46	46	43	46	46
F	3.711	3.211	12.22	4.346	3.709
F_p	8.36e-05	0.000403	0	1.26e-05	8.40e-05
ar2p	0.766	0.835	0.329	0.633	0.571
hansenp	0.649	0.125	0.453	0.187	0.145

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix A.2

Table 2.10: List of countries included in the dataset

Country	Region	Classification	Commodity dependence	Country	Region	Classification	Commodity dependence
Argentina	LAC	UMIC	Yes	Malaysia	EAP	UMIC	No
Bangladesh	SA	LIC	No	Mauritius	SSA	UMIC	No
Bolivia	LAC	LMIC	Yes	Mexico	LAC	UMIC	No
Botswana	SSA	UMIC	No	Morocco	MENA	LMIC	No
Brazil	LAC	UMIC	No	Mozambique	SSA	LIC	Yes
Burkina Faso	SSA	LIC	Yes	Myanmar	EAP	LIC	No
Cambodia	EAP	LIC	No	Namibia	SSA	LMIC	No
Cameroon	SSA	LIC	Yes	Nepal	SA	LIC	No
Chile	LAC	UMIC	Yes	Nigeria	SSA	LIC	Yes
China	EAP	LMIC	No	Pakistan	SA	LIC	No
Chinese Taipei*	EAP	-	-	Peru	LAC	LMIC	Yes
Colombia	LAC	LMIC	Yes	Philippines	EAP	LMIC	No
Costa Rica	LAC	UMIC	No	Republic of Korea	EAP	UMIC	No
Ecuador	LAC	LMIC	Yes	Rwanda	SSA	LIC	Yes
Egypt	MENA	LMIC	Yes	Senegal	SSA	LIC	Yes
Ethiopia	SSA	LIC	Yes	Singapore*	EAP	HIC	-
Ghana	SSA	LIC	Yes	South Africa	SSA	UMIC	No
Hong Kong*	EAP	HIC	-	Sri Lanka	SA	LMIC	No
India	SA	LIC	No	Tanzania	SSA	LIC	Yes
Indonesia	EAP	LIC	No	Thailand	EAP	LMIC	No
Israel*	MENA	HIC	-	Tunisia	MENA	LMIC	No
Japan*	EAP	HIC	-	Turkey	ECA	UMIC	No
Kenya	SSA	LIC	Yes	Uganda	SSA	LIC	Yes
Laos	EAP	LIC	No	Viet Nam	EAP	LIC	No
Lesotho	SSA	LIC	No	Zambia	SSA	LIC	Yes
Malawi	SSA	LIC	Yes				

Source: Elaboration by the author; Data from World Bank World Development Indicators.
Note: Countries with an asterisk are not included in the analysis. The income classification is taken from the base year 2000.

Appendix A.3

Table 2.11: Im-Pesaran-Shin Unit Root Test

Variable	t-bar	t-tilde bar	Fixed-N exact critical values			z-tilde-bar	p-value
			1%	**5%**	**10%**		
ΔGDP	-3.4862	-2.6023	-1.820	-1.730	-1.690	-10.7729	0.0000
ΔOpenness	-4.1611	-2.9548	na	na	na	-13.1241	0.0000
ΔGovernment_Expenditure	-4.5280	-2.9986	na	na	na	-13.4935	0.0000
ΔCommodity_Price_Index	-4.3096	-3.0232	na	na	na	-14.5063	0.0000
ΔManufacturing	-3.7218	-2.7752	-1.820	-1.730	-1.690	-12.3038	0.0000
ΔUtilities	-4.6172	-3.0362	-1.820	-1.730	-1.690	-14.6146	0.0000
ΔConstruction	-4.0145	-2.8504	-1.820	-1.730	-1.690	-12.9697	0.0000
ΔTrade_Services	-4.0627	-2.8914	-1.820	-1.730	-1.690	-13.3327	0.0000
ΔTransport_Services	-4.2977	-2.9404	-1.820	-1.730	-1.690	-13.7669	0.0000
ΔFinancial_Services	-4.0933	-2.8143	-1.820	-1.730	-1.690	-12.6502	0.0000
ΔReal_Estate	-4.2756	-2.8986	-1.820	-1.730	-1.690	-13.3964	0.0000
ΔBusiness_Services	-3.6394	-3.6394	-1.820	-1.730	-1.690	-10.9180	0.0000
ΔGovernment_Services	-3.9497	-2.8394	-1.820	-1.730	-1.690	-12.8721	0.0000
ΔOther-Services	-4.2226	-2.9008	-1.820	-1.730	-1.690	-13.4159	0.0000

Source: Elaboration by the author. Number of panels: 46, number of periods: 19. H0: All panels contain unit roots, Ha: Some panels are stationary. Panel means: Included, Time trend: Not included. For ΔOpenness and ΔGovernment_Expenditure Ethiopia, Lesotho, Malawi, Myanmar and Zambia were temporarily excluded from the sample to conduct the unit root test.

Chapter 3
Regional South-South Trade and the Dutch Disease: The Case of Latin American Manufacturing Exports

3.1 Introduction

The manufacturing sector plays a pivotal role in economic development due to its potential for economies of scale, technological learning, linkages to other sectors, and employment creation (van Wijnbergen 1984a; Krugman 1987; Hidalgo et al. 2007). It continues to be considered the most promising sector for economic development in developing economies (Szirmai 2012; Haraguchi et al. 2017; Su and Yao 2017; Gabriel and de Santana Ribeiro 2019). Nevertheless, many developing economies are experiencing premature deindustrialization, as evidenced by declining manufacturing output and employment shares (Tregenna 2015; Rodrik 2016). In countries with abundant natural resources, this process may be exacerbated by the phenomenon of the Dutch Disease (Corden and Neary 1982; Corden 1984). Conversely, numerous publications and international reports that examine the composition of export patterns in Africa and Latin America highlight that intra-regional exports frequently exhibit a higher proportion of manufacturing content than extra-regional exports (e.g., Yeats 1997; Bekerman and Rikap 2010; UNECA 2015; Döver 2024). Consequently, regional trade can contribute to strengthening manufacturing production and exports in developing economies.

Despite the existence of a substantial body of literature examining the Dutch Disease effects in resource-abundant developing economies, it is, to the best of our knowledge, an open question as to whether the composition of trade partners to which exports are directed has an impact on the magnitude of Dutch Disease effects.

The objective of this chapter is to establish a link between the existing literature on the Dutch Disease and that on regional trade. In this context, regional trade is defined as trade that takes place within a specific geographical region and between countries with similar levels of economic development. Under this definition, South-South trade in Latin America is an example of regional trade. We suggest two potential channels through which the composition of trade partners may exert an influence on the magnitude of Dutch Disease effects. Theoretical considerations indicate that a contraction of manufacturing exports due to Dutch Disease effects may be less likely to occur in exports to regional trade partners than to partners from outside the region. The first channel, the technological sophistication channel, departs from the observation that regional exports in Latin America and Africa contain a higher share of technologically more sophisticated products and that these products have a lower cost and price elasticity than low-tech manufacturing products. Consequently, when the Dutch Disease causes the real exchange rate to appreciate and the production costs of manufacturing exporters to rise, exports of more sophisticated products are less adversely affected. Second, the trade barrier and market entry cost channel provides an explanation for why exports to fellow regional trade partners are less likely to be replaced by foreign competitors. The Dutch Disease theory posits that manufacturing exports to all trade partners would become less competitive during the commodity price boom, leading to a substitution of these exports by exports from other countries. The main competitors are extra-regional, more industrialized exporters. However, they face relatively higher costs in regional trade due to market entry costs and trade barriers, such as transport costs and exclusion from regional trade agreements. Moreover, when a commodity price boom affects several countries in the region, regional competitors may also experience a decline in competitiveness due to Dutch Disease effects. As a result, exports from a commodity-dependent country to regional trade partners may experience a smaller loss in relative competitiveness than exports to extra-regional trade partners, potentially leading to a more stable export profile.

Against this theoretical background, this study examines whether regional trade can serve to mitigate the effects of the Dutch Disease on manufacturing exports. The empirical analysis examines the performance of manufacturing exports from Latin American countries from 1996 to 2018. This period includes the commodity price boom from 2003 to 2013, which provides considerable variation in commodity prices (Erten and Ocampo 2013). The impact these price changes have on manufacturing exports is examined via a Poisson Pseudo Maximum Likelihood Estimator with high-dimensional fixed effects (Santos Silva and Tenreyro 2006; Fally 2015). The effect on exports towards other Latin American countries is compared to the effect on exports to extra-regional trade partners. As expected, extra-regional manufacturing exports are significantly more negatively affected by rising commodity prices with an elasticity of -0.48% (compared to -0.31% in regional trade) to a one percent increase in commodity prices. This effect is mainly driven by low-tech exports, which are more negatively affected than medium- and high-tech exports and have an elasticity of -0.95% in extra-regional trade, compared to -0.58% in regional trade. The results are consistent with our predictions for the technological sophistication channel and the trade barrier and market entry cost channel.

Our results suggest that technological upgrading and regional trade integration may serve as potential mitigating factors against the contraction of the manufacturing sector during periods of elevated commodity prices. The evidence supports both channels, as Dutch Disease effects are strongest for exports to extra-regional trade partners and for low-technology products. The following section elaborates on both channels and the underlying rationale. Section 3.3 outlines the research design. The results of the analysis are presented in section 3.4 and discussed in section 3.5, before section 3.6 concludes the chapter.

3.2 Theoretical Argument

We develop two channels for explaining the mitigation of Dutch Disease effects through trade with regional trade partners. The starting point is the basic model of Dutch Disease proposed by Corden and Neary (1982). In a three-sector economy with a booming resource sector, a tradable manufacturing sector and a non-tradable service sector, a windfall in resource revenues leads to an increase in foreign financial inflows. These external financial inflows give rise to both the resource movement effect and the spending effect. The resource movement effect describes the reallocation of factors of production from the manufacturing and services sectors to the thriving resource sector, which offers higher wages and capital rents. The spending effect refers to the increase in demand for goods/services resulting from financial inflows. The demand for tradables can be met by imports, but the demand for non-tradables pushes up their prices. The result is an appreciation of the real exchange rate. Both the appreciation and the shift of productive factors away from manufacturing imply higher costs for manufacturing producers (Corden and Neary 1982). They lose their international competitiveness, and manufacturing exports decline.[15]

According to Cherif (2013), the Dutch Disease is expected to have a stronger impact on developing economies than on developed economies. A competitive real exchange rate is of paramount importance for the export performance of the former economies, while its influence is less pronounced in developed economies (Freund and Pierola 2012; Caglayan and Demir 2019; Bussière et al. 2020). Consequently, rising relative production costs associated with the Dutch Disease pose a significant challenge to manufacturing exports in developing economies such as those in Latin America.

Indeed, the empirical literature provides evidence that manufacturing exports decline due to Dutch Disease effects. Harding and Venables (2016) examine the effect of commodity exports on various non-commodity exports for 41 countries over the period 1970 to 2006. They find evidence that manufacturing exports show a stronger negative response than other non-commodity exports. For every additional dollar of non-resource exports, manufacturing exports decline by 46 cents. Stijns (2003) uses world trade data to examine the response of manufacturing exports in energy-exporting countries to rising energy prices. His results are close to those of Harding and Venables (2016), with a one percent increase in energy prices leading to a decline in manufacturing exports of about half a percent. Bahar and Santos (2018) analyze the effect of a sharp rise in commodity prices on the concentration of non-commodity exports and find that the diversification of non-commodity exports declines. Labor-intensive exports are the most affected, particularly in Latin America. Specifically for Latin America and the commodity price boom, which is also studied in this chapter, Albrieu (2012) points out that there was an appreciation of the real exchange rate in commodity-dependent countries. However, this appreciation did not have a negative impact on manufacturing exports. Heresi (2023) shows for Chile that the commodity price boom led to a reallocation of

[15] The Dutch Disease is economically problematic, as manufacturing has greater potential for economic development than other sectors (e.g. Prebisch 1950; van Wijnbergen 1984a; Krugman 1987; Hidalgo et al. 2007; Siliverstovs and Herzer 2007; Murshed and Serino 2011).

market shares from exporting firms to non-exporting firms within the manufacturing sector, with negative effects on the sector's productivity and exports.

In the following, we introduce how the composition of trade partners can affect the magnitude of Dutch Disease effects on manufacturing exports. To this end, we develop two channels that theoretically explain why trade with regional trade partners could mitigate the Dutch Disease. The first channel is the technological sophistication channel: Manufacturing exports to regional trade partners are expected to be less affected by Dutch Disease effects because, first, exports to these trade partners have a higher degree of technological sophistication and, second, technologically more advanced products are less sensitive to Dutch Disease effects.

In developing economies, intra-regional exports tend to be more technologically sophisticated than exports to industrialized countries. In intra-regional exports, the share of primary products is comparatively lower, while the share of manufactured products is higher. This has been observed not only in Latin America for the member countries of MERCOSUR (Yeats 1997; Snoeck et al. 2009; Bekerman and Rikap 2010; Mordecki Pupko and Piaggio Talice 2011), but also in other developing regions, such as intra-African trade (UNECA 2015; IMF 2019). At the same time, within manufacturing exports, technological sophistication is higher for exports to intra-regional trade partners, as shown in Figure 3.1 for merchandise exports of Latin American economies. It shows a much larger share, especially for medium-tech manufacturing, in regional trade.

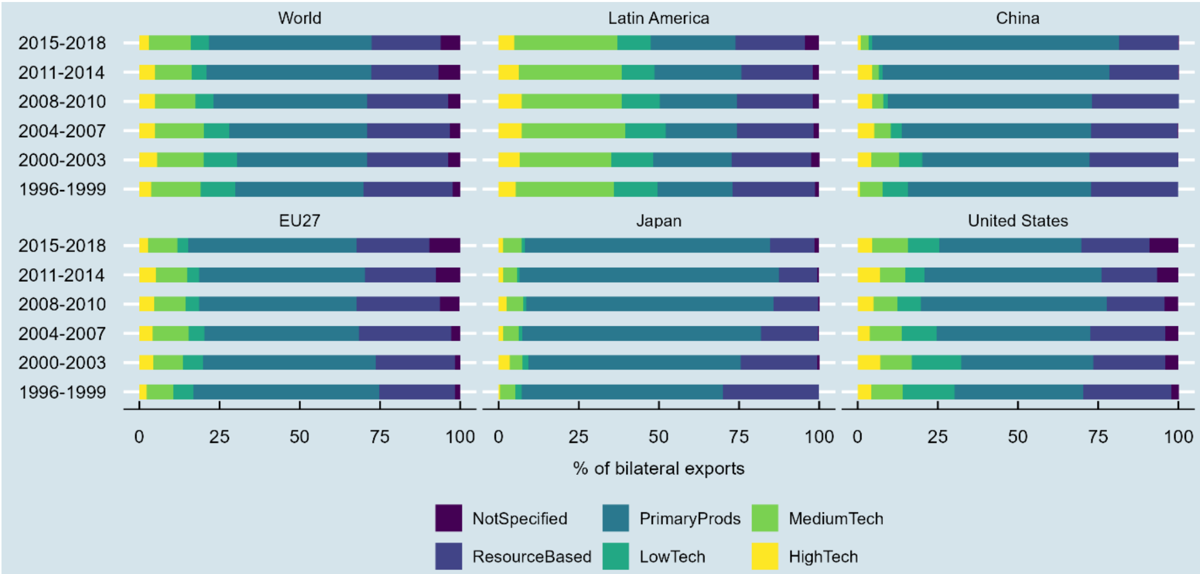

Figure 3.1: Evolution of technological export structure of Latin American economies to different export destinations (1996 – 2018, shares of total exports to partner (region)).
Source: Elaboration by the authors, based on The Growth Lab at Harvard University (2019).
Note: (1) Export structure according to Lall's (2000) classification, (2) exports from all exporters included in our study, except Mexico, due to the very particular trade structure of Mexico with the US.

There are several possible explanations for why the share of technologically more sophisticated manufacturing is higher in regional exports than in exports to the rest of the world. Not all of them have received sufficient attention in the literature. Some explanations focus on the reduction of regional tariffs and trade facilitation. Many economies in Latin America are integrated through a preferential trade agreement (PTA) (Dingemans and Ross 2012). The average applied tariff for regional trade in Latin America is 2%, well below the Most Favored Nation tariff of 7%. Moreover, 78% of intra-regional trade falls under a duty-free regime (ECLAC 2021). According to Bekerman and Rikap (2010) preferential tariffs offer the opportunity for regional markets to provide an initial export platform for the expansion of the manufacturing sector. This is reinforced by the investment strategies of extra-regional multinationals to produce within regional borders in order to access local markets with lower tariffs (ECLAC 2021).

In addition to tariffs, there are also non-tariff competitive advantages of regional exports in Latin America, as mentioned by Calzada Olvera and Spinola (2022, 15): "[G]eographical and cultural proximity, wage structure, technological capacity, and industrial activities are similar, and thus complex products are more likely to be competitive in terms of quality and cost". In a different regional context, Schmitt and Van Biesebroeck (2013) emphasize the importance of geographic and cultural proximity in the sourcing strategies of the European automotive industry, especially for technologically sophisticated products. For less sophisticated products, production costs are more critical. Similarly, Conconi et al. (2020) highlight the role of regional proximity in the trade of intermediate products to collaborate with suppliers, monitor production, and ensure timely delivery of customized inputs. In contrast, in trade with industrialized countries, technologically sophisticated products from the Global South often face difficulties in complying with product standards of multinational corporations that govern global value chains (GVCs) or with sanitary and phytosanitary standards in end-user markets in the Global North (Geyer 2019).

Technologically more sophisticated products are less sensitive to Dutch Disease effects because both cost and price elasticities are lower for more sophisticated products. For these products, firms can charge higher mark-ups. When production costs increase, firms do not have to pass on the full cost increase to the price of their products, but can reduce the markup to keep the price stable, leading to a lower cost elasticity (Berman et al. 2012; N. Chen and Juvenal 2014).[16] The price elasticity of products also decreases as the degree of technological sophistication increases. The lower degree of substitutability of these products reduces the competition they face (Carlin et al. 2001).

The resource movement effect of the Dutch Disease may likewise be less pronounced for more sophisticated products. Workers producing technologically advanced products tend to have higher skill levels (Arif 2021) and receive higher wages (Dalmazzo 2002; Cirera et al. 2022). Compared to workers in other industries, they would have relatively fewer financial benefits from moving to a job in the booming sector. Similarly, more sophisticated industries are more productive (Cirera et al. 2022), generating higher profits and returns to capital (Grifell-Tatjé and Lovell 1999). This implies that shifting capital to the booming sector is less attractive.

[16] In the particular case of real exchange rate appreciation in developing economies, there is an additional explanation for declining cost elasticities with technological sophistication. More sophisticated products require more imported inputs. Therefore, a smaller share of the cost of production is generated domestically. As a result, the appreciation affects a smaller share of production costs, reducing the overall impact of real exchange rate appreciation (Ahmed et al. 2015; Goda et al. 2024).

The combined effect of the lower price and cost elasticity and the less pronounced resource movement effect is that exports of more sophisticated products are less adversely affected by Dutch Disease effects. Goda et al. (2024) show empirically that low-tech exports in Latin American countries are negatively affected by real exchange rate appreciation, while medium- and high-tech exports show no significant response. Similarly, a study by Caglayan and Demir (2019) shows that high-tech exports are least affected by real exchange rate appreciation and volatility, and South-South exports are less affected than South-North exports.

The second channel, called the trade barrier and market entry cost channel, states that manufacturing exports to regional trade partners face less risk of substitution by extra-regional competitors than exports to extra-regional trade partners. In intra-regional trade, extra-regional competitors face some relative disadvantages, especially when entering a new market. Trade is not fully liberalized and there are significant costs of entering the market of a country to which a firm has not previously exported (Bernard and Jensen 2004; Das et al. 2007). These costs stem from the establishment of trade relationships and distribution infrastructure (Burstein et al. 2003; Corsetti and Dedola 2005; Das et al. 2007; N. Chen and Juvenal 2014), the adaptation of products and services to local needs and requirements, and tariff and nontariff barriers such as product standards, product approvals, and customs procedures (Maskus et al. 2005; M. X. Chen et al. 2008). When regional economies share lower tariffs with each other than with economies outside the region, such as in a free trade area or customs union, external competitors are further disadvantaged (Ruta 2017). Similarly, the emphasis on regional proximity in the sourcing of intermediate goods, as highlighted by Conconi et al. (2020), may provide some protection against substitution by competitors from outside the region. In addition, firms from the region may have an advantage in bargaining power due to cultural similarities with the target market (Calzada Olvera and Spinola 2022). Finally, assuming that the market to be entered is in another region, transport costs may be higher for firms from external countries than for countries within the same region (Moreira et al. 2008).

These market entry costs and trade barriers reduce the cost advantage of extra-regional competitors, which has implications for our theoretical framework of the Dutch Disease and regional trade. Dutch Disease effects raise the cost of manufacturing exports from the exporting country. As a result, they are replaced in extra-regional destination markets by competitors that do not face a commodity boom and can therefore sell the products at a lower price. For regional trade, there are intra-regional and extra-regional competitors. Because extra-regional competitors face relative cost disadvantages, they are less likely to substitute for regional firms' exports. In the case of a commodity boom affecting several countries within the region, regional competitors may also be affected by an appreciation of the real exchange rate and experience a similar loss of competitiveness.[17] As a result, these regional competitors are also less likely to replace exports from our home country because their relative competitiveness does not increase. This implies that only competitors from countries within the region that have not experienced a commodity price boom would be able to fully benefit from replacing exports from our home country. These competitors would have to produce the same product at a similar quality and price, and in quantities that would allow for expansion. Especially in developing economies, these characteristics are not necessarily present. Since this group of advantaged competitors is much smaller than in extra-regional trade, exports to regional trade partners should decline less than exports to extra-regional trade partners.

To summarize our newly introduced theoretical arguments, the technological sophistication channel and the trade barrier channel should reduce the pass-through of adverse Dutch Disease effects on manufacturing exports to regional trade partners relative to extra-regional trade partners during commodity price booms.

3.3 Research Design

In this section, we test our theoretical argument empirically. To answer the research question of whether commodity price increases have less adverse effects on manufacturing exports to regional trade partners than to extra-regional trade partners, we conduct a panel data analysis of bilateral manufacturing exports from Latin American economies over the period from 1996 to 2018. The sample includes low-, medium-, and high-tech manufacturing exports to 236 trade partners, distinguishing between regional and extra-regional destinations. The following subsection explains

[17] The 2003 to 2013 commodity price boom affected several commodities over a similar period of time, leading to simultaneous price booms in several Latin American countries (Gruss 2014).

the case selection and how our theoretical assumptions are reflected in this environment. Subsection 3.3.2 presents the estimation methodology.

3.3.1 Data

Economies in Latin America provide a particularly useful case for analyzing the relationship between Dutch Disease and regional trade. Like Africa, Latin America is home to many commodity-dependent economies that are struggling to industrialize or are facing deindustrialization (Diao et al. 2019; Rodrik 2016). The entire region has historically been characterized by high levels of commodity dependence, which increased further during the commodity price boom of 2003 to 2013 (Ocampo 2017a). At the same time, intra-regional trade played a larger role in Latin America during the commodity price boom compared to Africa.[18] Our data show that the share of regional trade is much higher for manufacturing exports (see Figure 3.1). [19] Nearly 44% and 49% of manufacturing exports in our country sample are exported to regional partners in 1996 and in 2018. [20] This relatively high share of intra-regional trade allows us to compare exports to regional trade partners with exports to extra-regional trade partners.

The observation period is from 1996 to 2018. The importance of international trade increased considerably with the establishment of the World Trade Organization in 1995 (Goldstein et al. 2007; P.-L. Chang and Lee 2011; Felbermayr et al. 2024). By starting the observation period in 1996, the entire development under this new world trade order is covered. Moreover, this period includes the commodity price boom from 2003 to 2013. This boom had an exceptionally long duration and involved substantial price increases for a wide range of commodities. Due to these characteristics, it was the most pronounced commodity price boom ever experienced by many Latin American countries (Erten and Ocampo 2013). Consequently, it represents a suitable case for studying Dutch Disease effects in the region.

[18] It accounted for 22 percent of total trade, while in Africa it was only 10 percent (in 2009) (Ben Barka 2012).

[19] In this chapter, we classify manufacturing as the sum of low-, medium-, and high-technology exports according to the Lall (2000) classification. We exclude resource-intensive manufacturing.

[20] For the Latin American exporters, excluding Mexico due to its very particular trade structure with the US.

We analyze manufacturing exports of 20 Latin American countries and divide their export destinations into two groups: 1) regional trade partners and 2) extra-regional trade partners. Regional trade partners represent the same country sample of the exporters.[21] Extra-regional trade partners include all other export destinations of the Latin American economies which are included in the dataset of 236 countries of The Growth Lab at Harvard University (2019).[22] The dataset is unbalanced due to missing values in the dependent variables.[23]

Manufacturing export data are disaggregated into low-, medium-, and high-technology manufacturing following Lall (2000).[24] The category of resource-based manufacturing is excluded because it is sensitive to the price effects of commodity price booms. In addition, low- to high-technology exports play a larger role in technological learning than resource-based exports (Oqubay and Ohno 2019). Manufacturing export data are converted from current to constant 2015 US dollar using the World Bank's gross domestic product (GDP) deflator for the United States.

The data for the explanatory variable, the commodity price index, comes from the IMF's commodity terms of trade database, which is described in more detail in Gruss and Kebhaj (2019). It represents the price evolution of each country's individual export commodities. These country-specific indices represent the respective commodity price evolution in much more detail than general commodity price indices (Gruss and Kebhaj 2019).[25] Moreover, compared to other indicators of a country's commodity revenues, such as commodity exports or commodity production, the use of commodity prices avoids endogeneity problems, as markets are global and individual countries can be assumed to be price takers (e.g., Broda 2004; Raddatz 2007; Medina 2016; Fernández et al. 2018; Gruss and Kebhaj 2019).[26]

[21] For a robustness check, we also include Caribbean countries in the category of regional trade partners.

[22] A list with the included trade partners can be found in Appendix B.2.

[23] This does not provide a problem as the estimation method can deal with unbalanced trade data.

[24] For more details about the product classification, see Appendix B.1.

[25] We use the gross export price index from the IMF database, only accounting for changes in export prices and not in import prices. Also, we use the index applying rolling weights to account for long-run trends in changes in the composition of export commodities. As the weights are lagged and predetermined to price fluctuations, they do not respond to endogenous changes in export volumes (Gruss and Kebhaj 2019).

[26] A complete list of the data sources for all used variables can be found in Appendix B.3.

3.3.2 Method

We use a Poisson Pseudo Maximum Likelihood (PPML) model with high-dimensional fixed effects. This estimation technique is widely used in econometrics to analyze count data or data with a non-negative integer outcome (Correia et al. 2020). It combines the PPML estimator, which is robust to certain forms of heteroskedasticity (Santos Silva and Tenreyro 2006), with the ability to control for high-dimensional fixed effects (Fally 2015), making it suitable for datasets with multiple sources of unobserved heterogeneity.

The following equations are used to test the hypothesis that manufacturing exports to regional trade partners are less negatively affected by Dutch Disease effects than manufacturing exports to extra-regional trade partners:

$$Y_{c,i,j,t} = \exp[\alpha_0 lnComPrice_{it} * Tech_c + \alpha_1 X + \gamma_i + \eta_j + \delta_t + \theta_c + \mu_{c,i,j}] + \epsilon_{c,i,j,t} \quad (3.1)$$

$$Y_{c,i,j,t} = \exp[\alpha_0 lnComPrice_{it} * TP + \alpha_1 X + \gamma_i + \eta_j + \delta_t + \theta_c + \mu_{c,i,j}] + \epsilon_{c,i,j,t} \quad (3.2)$$

Equation (3.1) estimates whether there are differences in the effect of commodity prices on export values according to the technological sophistication of exports. In our data, exports are classified into low-, medium-, and high-technology according to their technological sophistication c. In equation (3.1), $Y_{c,i,j,t}$ describes manufacturing exports of technology level c from country i to trade partner j in year t. These exports are estimated using the individual commodity price index of each exporting country ($lnComPrice_{it}$) and the control variables in vector X. The commodity price is interacted with a dummy for the technology level $Tech$ to see if its effects differ according to the technology level of the exports. The included fixed effects are γ for the exporter, η for the importer, δ for the year, θ for the technology level and μ for exporter-importer-technology level fixed effects. It is most common in PPML models to apply importer-year, exporter-year, and exporter-importer fixed effects (Head and Mayer 2014). In this case, however, it would not be possible to include importer-year and exporter-year fixed effects because they would cancel out the effects of the exporter's commodity price index and the importer's GDP due to perfect multicollinearity.

Therefore, instead of exporter-year and importer-year fixed effects, we use exporter, importer and time fixed effects separately. μ is an adapted version of the exporter-importer fixed effect that also takes into account the technology level of exports between the two countries and is thus more specific. ϵ is the error term and standard errors are clustered at the exporter-importer-technology level as this is the most disaggregated level.

Building on the determination of the Dutch Disease effects via equation (3.1), equation (3.2) aims to test our hypothesis. The interaction of the commodity price with the technology level is replaced by an interaction term with a dummy for regional and extra-regional trade partners TP. This allows us to differentiate the effect of commodity price increases on exports to these different groups of trade partners. To obtain elasticities, all independent variables, except for the dummy variables, are logarithmized.

In the baseline estimation, the control variable in vector X is the GDP of the trade partner. On the one hand, it represents the market size of the destination economy. Larger markets offer greater market potential. For firms, this means potentially larger economies of scale and better sales opportunities. In theory, this larger market could also be reached by exporting to several small and medium-sized economies. However, due to market entry costs, exporting to a few larger economies is considered more efficient (R. Martin and Sunley 1996; Bernard and Jensen 2004; Goda and Sánchez González 2024). On the other hand, changes in the GDP of trade partners are associated with changes in their demand. For both reasons, an increase in the GDP of a trade partner is expected to have a positive effect on manufacturing exports to that economy. The data for trade partners' GDP comes from the World Bank's World Development Indicators. Since the current GDP dataset has more data points than the constant dataset, we manually calculated the constant 2015 values using the GDP deflator.

For robustness tests, we include PTAs as another control variable in the estimation, change the composition of regional trade partners by including Caribbean countries, and control for the degree of commodity dependence of Latin American exporters.[27]

[27] An explanation of the choice of the robustness tests is provided in the robustness test subsection in section 3.4.

3.4 Results

As a first step, we estimate whether Dutch Disease effects caused a decline in Latin American manufacturing exports during our observation period. To do so, we estimate the impact of commodity price changes on low-, medium-, and high-tech manufacturing exports. We assess whether our prediction that low-tech exports are most affected by the Dutch Disease is true. Column 1 of Table 3.1 shows the results for estimating the value of manufacturing exports. The coefficients of the interaction terms of the commodity price with low-, medium-, and high-tech indicate the extent to which a one percent increase in the commodity price affects exports in each category. The effect is significant for all three categories, but it is strongest for low-tech exports, with exports falling by 0.92% for a 1% increase in commodity prices. For medium-tech and high-tech exports, the declines are smaller at 0.41% and 0.49%, respectively. This difference is statistically significant, as shown in column 1 of Table 3.2. It shows the difference between the impact of commodity prices on low-tech exports and the impact on the other two categories (the difference between the values in column 1 of Table 3.1) and indicates whether this difference is statistically significant: Low-tech exports are significantly more negatively affected by rising commodity prices than medium- and high-tech exports. As expected, a higher trade partner's GDP is associated with an increase in the value of manufacturing exports.

Next, we assess whether, as we hypothesize, there is a stronger negative effect of commodity price increases on extra-regional exports than on regional exports. The results in column 2 of Table 3.1 show that the effect is negative for both groups. However, the effect is stronger, with a decline of 0.48%, and more significant (1% level) for extra-regional exports than for regional exports, where the decline of 0.31% is only significant at the 10% level. Again, we assess whether this difference is statistically significant (column 2, Table 3.2) and find that regional exports are indeed significantly less affected by rising commodity prices at the 10% level.

To test the full model, we combine the two components, technology level and export destination, in Table 3.3. The results show that extra-regional exports are more negatively affected than regional exports in all categories. The effect is particularly strong for extra-regional low-tech exports, which fall by 0.95%, while regional low-tech exports fall by only 0.58%. The coefficients for rising commodity prices are significant for all categories in extra-regional exports, while for regional exports the effect on medium-tech exports is insignificant.

Low-tech exports are also more affected than medium- and high-tech exports in both regional and extra-regional trade. As shown in Table 3.4, extra-regional low-tech exports are more than twice as negatively affected as extra-regional medium- and high-tech exports, and this difference is significant. Extra-regional low-tech exports are also significantly more negatively affected than regional low-tech exports, with a larger decline of 0.37 percentage points. Similar analyses for medium- and high-tech exports show that the difference between extra-regional and regional trade is not significant for these categories.[28]

Table 3.1: Effect of commodity prices on low-, medium-, and high-tech exports and on regional and extra-regional trade partners

	(1) Manufacturing Exports	(2) Manufacturing Exports
Log Commodity Price * Low-tech	-0.921***	
	(0.145)	
Log Commodity Price * Medium-tech	-0.408***	
	(0.155)	
Log Commodity Price * High-tech	-0.485***	
	(0.139)	
Log Commodity Price * Extra-regional		-0.481***
		(0.139)
Log Commodity Price * Regional		-0.310*
		(0.180)
Log Importer GDP	0.604***	0.555***
	(0.0636)	(0.0856)
Observations	132,299	132,299
Pseudo R2	0.987	0.987

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

[28] Results in Appendix B.4.

Table 3.2: Effect of commodity prices on regional exports in difference to extra-regional exports

	(1) Manufacturing Exports	(2) Manufacturing Exports
Log Commodity Price * Low-tech	-0.921***	
	(0.145)	
Difference between Low- and Medium-tech	0.513***	
	(0.0482)	
Difference between Low- and High-tech	0.437***	
	(0.0566)	
Log Commodity Price * Extra-regional		-0.481***
		(0.139)
Difference between extra-regional and regional		0.171*
		(0.0897)
Log Importer GDP	0.604***	0.555***
	(0.0636)	(0.0856)
Observations	132,299	132,299
Pseudo R2	0.987	0.987

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.3: Effect of commodity prices on low-, medium-, and high-tech exports differentiated by regional and extra-regional trade partners

	Manufacturing Exports
Extra-regional:	
Log Commodity Price * Low-tech	-0.948***
	(0.158)
Log Commodity Price * Medium-tech	-0.397***
	(0.152)
Log Commodity Price * High-tech	-0.464***
	(0.140)
Regional:	
Log Commodity Price * Low-tech	-0.582***
	(0.177)
Log Commodity Price * Medium-tech	-0.243
	(0.199)
Log Commodity Price * High-tech	-0.344**
	(0.170)
Log Importer GDP	0.548***
	(0.0720)
Observations	132,299
Pseudo R2	0.987

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.4: Difference between the effect of commodity price increases on extra-regional low-tech and the other categories of exports

	Manufacturing Exports
Log Commodity Price * ERLT	-0.948***
	(0.158)
Difference between ERLT and ERMT	0.551***
	(0.0671)
Difference between ERLT and ERHT	0.484***
	(0.0761)
Regional:	
Difference between ERLT and RLT	0.366***
	(0.107)
Difference between ERLT and RMT	0.705***
	(0.133)
Difference between ERLT and RHT	0.604***
	(0.113)
Log Importer GDP	0.548***
	(0.0720)
Observations	132,299
Pseudo R2	0.987

Note: ER = extra-regional, R = regional, LT = low-tech, MT = medium-tech, HT = high-tech.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Robustness tests

To test the robustness of our results we include PTAs as another control variable and extend the classification of regional trade partners by including Caribbean countries in this category. Finally, we control for the level of commodity dependence of our exporters.[29]

PTAs between trade partners provide a relative competitive advantage over non-PTA competitors by reducing tariff and non-tariff barriers to the export destination market (Ruta 2017). Consequently, we expect the presence of a trade agreement to increase the volume of exports. The data for trade agreements are taken from the *NSF-Kellogg Institute Database on Economic Integration Agreements*, and we use a dummy that takes the value of 1 if any type of listed trade agreement is in force between the two trade partners. We include trade agreements with regional and extra-regional trade partners only in the robustness tests and not in our baseline estimation because the

[29] The results of the robustness tests are found in Appendix B.5.

trade agreement dataset covers fewer countries and including them would considerably reduce our sample size.

Although Caribbean countries are geographically close to mainland Latin American nations, they lack land borders, have varying degrees of cultural proximity, and are less integrated into the Latin American market. As a result, they are classified as extra-regional trade partners in our baseline estimation. However, due to their geographical proximity and comparable level of economic development we include them as regional trade partners in a robustness test.

We account for the heterogeneity of commodity dependence and commodity boom experience in Latin America by dividing our sample into boom and non-boom economies. Following the classification of Flechtner and Middelanis (2024), we consider boom economies to be those that experienced an improvement in their terms of trade during the commodity price boom and have a commodity dependence of at least 50% of their exports. According to this classification, Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Peru and Venezuela are classified as boom economies. We expect Dutch Disease effects to be more pronounced for the exports of these economies.

Changing the classification of Caribbean countries from extra-regional to regional trade partners does not significantly alter the results. Similarly, the main trends remain very stable in magnitude and significance when considering the presence of PTAs. In fact, our main argument that regional trade is less affected by Dutch Disease effects than extra-regional trade is strengthened when controlling for PTAs, as the effect of commodity price increases on regional exports becomes weaker (-0.265 instead of -0.310) and insignificant. The significance of the difference in the effect of commodity price increases on extra-regional versus regional exports becomes more significant (5% level instead of 10% level). The effect on regional high-tech exports is also weaker and less significant. As expected, the effect of PTAs on the value of manufacturing exports is positive and significant in all specifications.

For the distinction between boom and non-boom exporters, we confirm our expectation that Dutch Disease effects are stronger for boom exporters. However, we also find a significant negative effect of commodity price increases on extra-regional exports for non-boom exporters. Although this effect is weaker in magnitude, the result suggests that Dutch Disease effects are a relevant phenomenon not only for the most commodity-dependent countries in the region, but for the region in general.

3.5 Discussion

Our results, presented in Section 3.4, provide some interesting insights into whether trade with regional trade partners mitigates Dutch Disease effects. Table 3.5 summarizes the main results including their interpretation with respect to our hypotheses.

Table 3.5: Results and their interpretation

Result	Table	Reference to hypothesis	Interpretation
Rising commodity prices lead to a decline in manufacturing exports	3.1	In line with classical Dutch Disease theory	Confirms that Dutch Disease is relevant in country sample
Low-tech exports are more affected than more sophisticated exports	3.1	In line with theory about cost- and price elasticity	Confirms assumption of technological sophistication channel
Significant difference between Dutch Disease effects on extra-regional and regional exports	3.1 3.2	In line with our hypothesis	Regional trade less affected by Dutch Disease effects, possible explanations: technological sophistication channel and trade barrier channel
When disaggregating by technology level and region: all significantly negatively affected but regional medium-tech exports	3.3	In line with our hypothesis	The trade barrier and the technological sophistication channel can explain these results
When disaggregating by technology level and region: significant difference between regional and extra-regional exports only for low-tech	3.4	In line with trade barrier and market entry cost channel	Stronger Dutch Disease effects provide more space for mitigation

Source: Elaboration by the authors.

First, we observe a substantial and significant Dutch Disease-like effect of rising commodity prices on manufacturing exports during our analyzed period, with significant negative effects across all three technology levels. Notably, low-tech exports are significantly more affected than medium- and high-tech exports, supporting our hypothesis that due to greater cost- and price sensitivity, low-tech industries are more vulnerable to Dutch Disease.

This finding provides the basis for the technological sophistication channel. Since extra-regional trade contains a larger share of low-tech exports, it should be more affected by Dutch Disease effects. Indeed, when considering aggregated manufacturing exports, extra-regional exports experience a significantly greater negative impact from Dutch Disease effects compared to regional exports. The respective declines, 0.48% for extra-regional exports and 0.31% for regional exports, align closely with the findings of Harding and Venables (2016) and Stijns (2003), who find declines in manufacturing exports of around half a percent. The larger decline in extra-regional exports can be explained by the technological sophistication channel. At the disaggregated level, however, the technological sophistication channel cannot explain why there is a significant difference between extra-regional and regional low-tech exports. Instead, this result can be explained by the trade barrier and market entry cost channel, which mitigates the loss of competitiveness of regional exports and thus their contraction. Consequently, our results align with both channels we have introduced in this chapter. We find that the difference between regional and extra-regional exports is mainly driven by low-tech exports. This is not surprising since the Dutch Disease effect is strongest for this category, so there are more opportunities for the Dutch Disease effect to be mitigated by regional trade and for the positive effects of the trade barrier and entry cost channel to materialize.

At first glance, it seems surprising that the effect is stronger and, in some specifications, more significant for high-tech exports than for medium-tech exports. However, as shown in Figure 3.1, high-tech exports play only a marginal role in the export structure of Latin American economies. Another possible explanation is that some exports classified as high-tech actually reflect assembly activities within GVCs and therefore involve less technology than reported. Consequently, at least for Latin American economies, medium-tech exports may be the more appropriate indicator of more sophisticated exports.

3.6 Conclusion

In this chapter, we established a link between the literatures on the Dutch Disease and on regional trade. Two channels are introduced through which regional trade might mitigate the effects of the Dutch Disease during a commodity price boom. The technological sophistication channel suggests that more sophisticated exports are less affected by the Dutch Disease due to lower cost and price sensitivity. Since regional trade contains a higher degree of technological sophistication, it should be less affected by the Dutch Disease. The trade barrier channel suggests that the loss of competitiveness of regional exports relative to those of extra-regional competitors due to Dutch Disease effects could be reduced by the entry costs and trade barriers faced by these extra-regional competitors.

These theoretical considerations are empirically tested using data on bilateral manufacturing exports of Latin American countries from 1996 to 2018. The results show, first, that there is a negative Dutch Disease effect of rising commodity prices on manufacturing exports. Second, the Dutch Disease effect is most pronounced for low-tech exports, as predicted by the technological sophistication channel. Third, we find significantly lower Dutch Disease effects on manufacturing exports to regional trade partners than to extra-regional trade partners. These significantly lower effects are found for aggregated manufacturing exports, where a one percent increase in commodity prices leads to a 0.48% decline in extra-regional exports, while the decline is only 0.31% for regional exports. The higher share of more sophisticated exports in regional trade may be one reason for this difference. At the same time, a disaggregation by technology level shows that this difference is mainly driven by the impact on low-tech exports, which decline by 0.95% to extra-regional trade partners, significantly more than the 0.58% decline to regional trade partners. While the technological sophistication channel cannot explain this difference, it could come from the market entry costs and trade barriers channels. Consequently, we find evidence for our hypothesis that regional trade mitigates the negative effects of the Dutch Disease.

These results highlight the importance of regional trade for commodity-dependent developing economies. During a commodity price boom, further regional integration could help mitigate unwanted Dutch Disease effects. In addition, the results show that technological upgrading can also reduce the vulnerability of the manufacturing sector to commodity price changes. For Latin American countries struggling to industrialize and suffering from premature deindustrialization, these results provide a strong case for industrial upgrading strategies aimed at moving from low-tech to mainly medium-tech exports. Strengthening regional trade integration can help achieve this goal. While we have conducted an empirical study for Latin America, our theoretical considerations suggest that similar conclusions may hold for other commodity-dependent late industrializers. Future research could focus on this aspect.

Appendix B

Appendix B.1

Table 3.6: Technological classification of exports (SITC 3-digit, revision 2)

Low technology manufacturers (LT1: Textile, Garnment and Footwear & LT2: Other products)	
LT1: Textile, garment and footwear	**LT2: Other products**
611 Leather	642 Paper, etc. precut, articles of
612 Leather etc. manufactures	665 Glassware
613 Fur skins tanned, dressed	666 Pottery
651 Textile yarn	673 Iron, steel shapes etc.
652 Cotton fabrics, woven	674 Iron, steel universal plate, sheet
654 Other woven textile fabric	675 Iron, steel hoop, strip
655 Knitted, etc. fabrics	676 Railway rails, etc. iron steel
656 Lace, ribbons, tulle, etc.	677 Iron, steel wire (exc. rod)
657 Special textile fabric, products	679 Iron, steel castings unworked
658 Textile articles nes	691 Structures and parts nes
659 Floor coverings, etc.	692 Metal tanks, boxes, etc.
831 Travel goods, handbags	693 Wire products non-electrical
842 Mens outerwear not knitted	694 Steel, copper nails, nuts, etc.
843 Womens outerwear non-knitted	695 Tools
844 Under garments not-knitted	696 Cutlery
845 Outerwear knit non-elastic	697 Base metal household equipment
846 Under garments knitted	699 Base metal manufactures nes
847 Textile clothing accessories nes.	821 Furniture, parts thereof
848 Headgear, non-textile clothing	893 Articles of plastic nes
851 Footwear	894 Toys, sporting goods, etc.
	895 Office supplies nes
	897 Gold, silver ware, jewellery
	898 Musical instruments, parts
	899 Other manufactured goods

Medium technology manufacturers (MT1: Automotive, MT2: Process, MT3: Engineering)	
MT1: Automotive	**MT3: Engineering**
781 Passenger motor vehicle excluding buses	711 Steam boilers and auxiliary plant

782 Lorries, special motor vehicles nes	713 Internal combustion piston engines
783 Road motor vehicles nes	714 Engines and motors nes
784 Motor vehicles parts, accessories nes	721 Agricultural machinery, excluding tractors
785 Cycles, etc. motorized or not	722 Tractors non-road
MT2: Process	723 Civil, engineering equipment etc.
266 Synthetic fibres to spin	724 Textile, leather machinery
267 Other man-made fibres	725 Paper etc. mill machinery
512 Alcohols, phenols etc.	726 Printing bookbinding machinery, parts
513 Carboxylic acids, etc.	727 Food machinery non-domestic
533 Pigments, paints, etc.	728 Other machinery for special industries
553 Perfumery, cosmetics, etc.	736 Metalworking machine tools
554 Soap, cleansing, etc. preparations	737 Metalworking machinery nes
562 Fertilizers, manufactured	741 Heating, cooling equipment
572 Explosives, pyrotech products	742 Pumps for liquids, etc.
582 Products of condensation etc.	743 Pumps nes, centrifuges, etc.
583 Polymerization, etc. products	744 Mechanical handling equipment
584 Cellulose derivatives, etc.	745 Non-electrical machinery tools nes
585 Plastic material nes	749 Non-elec machinery parts, acc nes
591 Pesticides disinfectants	762 Radio broadcast receivers
598 Miscellaneous chemical products nes	763 Sound recorders, phonograph
653 Woven man-made fibre fabric	772 Switchgear, etc. parts nes
671 Pig iron etc.	773 Electrical distributing equipment
672 Iron, steel primary forms	775 Household type equipment nes
678 Iron, steel tubes, pipes, etc.	793 Ships and boats etc.
786 Trailers, non-motorized vehicles, nes	812 Plumbing, heating, lighting equipment
791 Railway vehicles	872 Medical instruments nes
882 Photo, cinema supplies	873 Meters and counters nes
	884 Optical goods nes
	885 Watches and clocks
	951 War firearms, ammunition

High technology manufacturers (HT1: Electronic and electrical, HT2: Other)	
HT1: Electronic and electrical	**HT2: Other**
716 Rotating electric plant	524 Radioactive, etc. material
718 Other power-generating machinery	541 Medicinal, pharmaceutical products
751 Office machines	712 Steam engines, turbines
752 Automatic data processing equipment	792 Aircraft, etc.

759 Office, automatic data processing machine parts, accessories 761 Television receivers 764 Telecom equipment parts, accessories nes 774 Electro-medical, x-ray equipment 776 Transistors, valves, etc. 778 Electrical machinery nes	871 Optical instruments 874 Measuring, controlling instruments 881 Photo apparatus, equipment nes

Source: Elaboration by the authors, data from Lall (2000).
Note: "Excludes 'special transactions' like electric current, cinema film, printed matter, special transactions, gold, works of art, coins, pets."

Appendix B.2

Table 3.7: List of trade partners

Regional boom economies (8)	**Extra-regional economies (213)**
ARG, BOL, BRA, CHL, COL, ECU, PER, VEN	ABW, AFG, AGO, AIA, ALB, AND, ANT, ARE, ARM, ASM, ATA, ATF, ATG, AUS, AUT, AZE, BDI, BEL, BEN, BFA, BGD, BGR, BHR, BHS, BIH, BLM, BLR, BMU, BRB, BRN, BTN, BVT, BWA, CAF, CAN, CCK, CHE, CHN, CIV, CMR, COD, COG, COK, COM, CPV, CUW, CYM, CYP, CZE, DEU, DJI, DMA, DNK, DZA, EGY, ERI, ESH, ESP, EST, ETH, FIN, FJI, FLK, FRA, FRO, FSM, GAB, GBR, GEO, GHA, GIB, GIN, GLP, GMB, GNB, GNQ, GRD, GRL, HKG, HRV, HUN, IDN, IND, IOT, IRL, IRN, IRQ, ISL, ISR, ITA, JAM, JOR, JPN, KAZ, KEN, KHM, KIR, KNA, KOR, KWT, LAO, LBN, LBR, LBY, LCA, LKA, LSO, LTU, LUX, LVA, MAC, MAF, MAR, MDA, MDG, MDV, MHL, MKD, MLI, MLT, MMR, MNG, MNP, MOZ, MRT, MSR, MUS, MWI, MYS, MYT, NAM, NCL, NER, NFK, NGA, NIU, NLD, NOR, NPL, NRU, NZL, OMN, PAK, PCN, PHL, PLW, PNG, POL, PRI, PRK, PRT, PSE, PYF, QAT, ROU, RUS, RWA, SAU, SCG, SDN, SEN, SGP, SHN, SLE, SMR, SOM, SPM, SRB, SSD, STP, SVK, SVN, SWE, SWZ, SXM, SYC, SYR, TCA, TCD, TGO, THA, TJK, TKL, TKM, TLS, TON, TTO, TUN, TUR, TUV, TWN, TZA, UGA, UKR, UMI, USA, UZB, VAT, VCT, VGB, VNM, VUT, WLF, WSM, YEM, ZAF, ZMB, ZWE
Regional non-boom economies (12)	
BLZ, CRI, SLV, GTM, HND, MEX, NIC, PAN, GUY, PRY, SUR, URY	
Caribbean economies (3)	
CUB, DOM, HTI	

Source: Elaboration by the authors, data from the Atlas of Economic Complexity (The Growth Lab at Harvard University, n.d.).

Appendix B.3

Table 3.8: Data references

Variable	Description	Data source
Low-, medium-, and high-tech manufacturing data	Bilateral manufacturing export data is retrieved by matching data from the Growth Lab at Harvard University with a product key according to the Lall (2000) classification of the technological content of exports. Constant values are manually calculated with the GDP deflator.	The Growth Lab at Harvard University & Lall (2000)
Trade partner's GDP (constant 2015 US$)	Manually calculated with WDI data and GDP deflator – less gaps than constant WDI GDP	World Development Indicators (WDI)
Commodity Terms of Trade	Commodity Export Price Index, Individual Commodites Weighted by Ratio of Exports to Total Commodity Exports Historical, Annual (1962 - present), Rolling Weights, Index (2012 = 100)	IMF commodity terms of trade database
GDP deflator (constant 2015 $)		World Bank
Preferential trade agreements	Dummy for any active preferential trade agreement in goods	NSF-Kellogg Institute Data Base on Economic Integration Agreements

Source: Elaboration by the authors.

Appendix B.4

Table 3.9: Difference between the effect of commodity price increases on extra-regional medium-tech and the other categories of exports

	Manufacturing Exports
Log Commodity Price * ERMT	-0.948***
	(0.158)
Difference between ERMT and ERLT	-0.551***
	(0.0671)
Difference between ERMT and ERHT	-0.0670
	(0.0475)
Regional:	
Difference between ERMT and RLT	-0.185**
	(0.0893)
Difference between ERMT and RMT	0.154
	(0.119)
Difference between ERMT and RHT	0.0535
	(0.0964)
Log Importer GDP	0.548***
	(0.0720)
Observations	132,299
Pseudo R2	0.987

Note: ER = extra-regional, R = regional, LT = low-tech, MT = medium-tech, HT = high-tech.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.10: Difference between the effect of commodity price increases on extra-regional high-tech and the other categories of exports

	Manufacturing Exports
Log Commodity Price * ERHT	-0.464***
	(0.140)
Difference between ERHT and ERLT	-0.484***
	(0.0761)
Difference between ERHT and ERMT	0.0670
	(0.0475)
Regional:	
Difference between ERHT and RLT	-0.118
	(0.0934)
Difference between ERHT and RMT	0.221*
	(0.121)
Difference between ERHT and RHT	0.120
	(0.0984)
Log Importer GDP	0.548***
	(0.0720)
Observations	132,299
Pseudo R2	0.987

Note: ER = extra-regional, R = regional, LT = low-tech, MT = medium-tech, HT = high-tech.

Appendix B.5

Table 3.11: Robustness test: Effect of commodity prices on low-, medium-, and high-tech exports and on regional and extra-regional trade partners

Manufacturing Exports	(1)	(2)	(3)	(4)
Log Commodity Price * Low-tech	-0.923***	-0.921***		
	(0.146)	(0.145)		
Log Commodity Price * Medium-tech	-0.409***	-0.408***		
	(0.159)	(0.155)		
Log Commodity Price * High-tech	-0.493***	-0.485***		
	(0.141)	(0.139)		
Log Commodity Price * Extra-regional			-0.481***	-0.481***
			(0.141)	(0.139)
Log Commodity Price * Regional			-0.265	-0.319*
			(0.185)	(0.180)
Trade Agreement	0.284***		0.305***	
	(0.0752)		(0.0787)	
Log Importer GDP	0.560***	0.604***	0.490***	0.557***
	(0.0701)	(0.0636)	(0.0967)	(0.0854)
Observations	95,022	132,299	95,022	132,299
Pseudo R2	0.988	0.987	0.988	0.987
Caribbean as regional	No	Yes	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.12: Robustness test: Effect of commodity prices on regional exports in difference to extra-regional exports

Manufacturing Exports	(1)	(2)
Log Commodity Price * Extra-regional	-0.481***	-0.481***
	(0.141)	(0.139)
Difference between regional and extra-regional	0.216**	0.162*
	(0.0916)	(0.0886)
Trade Agreement	0.305***	
	(0.0787)	
Log Importer GDP	0.490***	0.557***
	(0.0967)	(0.0854)
Observations	95,022	132,299
Pseudo R2	0.988	0.987
Caribbean as regional	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.13: Robustness test: Effect of commodity prices on low-, medium-, and high-tech exports differentiated by regional and extra-regional trade partners

	(1)	(2)
Manufacturing Exports		
Extra-regional:		
Log Commodity Price * Low-tech	-0.947***	-0.952***
	(0.159)	(0.159)
Log Commodity Price * Medium-tech	-0.396**	-0.397***
	(0.154)	(0.152)
Log Commodity Price * High-tech	-0.469***	-0.465***
	(0.142)	(0.140)
Regional:		
Log Commodity Price * Low-tech	-0.547***	-0.585***
	(0.179)	(0.176)
Log Commodity Price * Medium-tech	-0.197	-0.253
	(0.202)	(0.198)
Log Commodity Price * High-tech	-0.296*	-0.345**
	(0.172)	(0.170)
Trade Agreement	0.304***	
	(0.0773)	
Log Importer GDP	0.482***	0.548***
	(0.0834)	(0.0721)
Observations	95,022	132,299
Pseudo R2	0.988	0.987
Caribbean as regional	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.14: Difference between the effect of commodity price increases on extra-regional low-tech and the other categories of exports

	(1)	(2)
Manufacturing Exports		
Log Commodity Price * ERLT	-0.947***	-0.952***
	(0.159)	(0.159)
Difference between ERLT and ERMT	0.551***	0.555***
	(0.0675)	(0.0693)
Difference between ERLT and ERHT	0.478***	0.487***
	(0.0752)	(0.0780)
Regional:		
Difference between ERLT and RLT	0.400***	0.367***
	(0.111)	(0.107)
Difference between ERLT and RMT	0.750***	0.698***
	(0.136)	(0.133)
Difference between ERLT and RHT	0.651***	0.607***
	(0.117)	(0.114)
Trade Agreement	0.304***	
	(0.0773)	
Log Importer GDP	0.482***	0.548***
	(0.0834)	(0.0721)
Observations	95,022	132,299
Pseudo R2	0.988	0.987
Caribbean as regional	No	Yes

Note: ER = extra-regional, R = regional, LT = low-tech, MT = medium-tech, HT = high-tech.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.15: Effect of commodity price increases on regional and extra-regional exports for boom and non-boom exporters

	Manufacturing Exports
Log Commodity Price * Boom * Extra-regional	-0.806***
	(0.214)
Log Commodity Price * Boom * Regional	-0.579***
	(0.215)
Log Commodity Price * Non-Boom * Extra-regional	-0.535***
	(0.141)
Log Commodity Price * Non-Boom * Regional	-0.139
	(0.176)
Log Importer GDP	0.583***
	(0.0814)
Observations	132,299
Pseudo R2	0.987

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Chapter 4

The Role of the Commodity Price Boom in Shaping Public Social Spending: Evidence from Latin America

Chapter 4 of this dissertation has already been published in the scientific journal World Development:

Flechtner, Svenja, and Martin Middelanis. 2024. "The Role of the Commodity Price Boom in Shaping Public Social Spending: Evidence from Latin America." *World Development* 182 (October): 106717. https://doi.org/10.1016/j.worlddev.2024.106717.

World Development 182 (2024) 106717

Contents lists available at ScienceDirect

World Development

journal homepage: www.elsevier.com/locate/worlddev

Regular Research Article

The role of the commodity price boom in shaping public social spending: Evidence from Latin America

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ARTICLE INFO

Dataset link: https://github.com/svenjafl/socialspending_replication

Keywords:
Social spending
Social policy expansion
Commodity boom
Latin America
Structural vector auto-regression
Local projections

ABSTRACT

We study the potential impact of the commodity price boom of 2003 to 2013 on public social spending in Latin America. We estimate structural vector autoregressions and local projections for 16 Latin American countries over the period from 1990 to 2019 and investigate if we can attribute increases in public spending on health, education, and social protection to increases in a country's net commodity terms-of-trade. By focusing on the impulse responses derived from country-specific estimations, we find a huge variety in response patterns. Our study finds that two countries experienced lasting increases in public social spending due to the commodity boom (Argentina, Ecuador). Some others observed at least temporary increases of few years (Brazil, Mexico), reacted first with declines and then rises (Chile), and yet others did not respond at all (Bolivia, Colombia, Peru). As expected, we cannot relate public social spending with commodity prices in countries without commodity price boom. Among countries with positive responses, there is no clear tendency concerning the function of spending that benefits most. We discuss potential explanations behind the heterogeneity of our country-wise results and conclude that the presence of left-wing governments, fiscal rules, natural resource funds and economic diversification provide plausible explanations for single country cases, but no general patterns emerge. We conclude that the commodity price boom was neither necessary nor sufficient for social policy expansion in Latin America, and factors explaining its effects differ from country to country. Our study highlights the importance of in-depth examinations of country-specific factors and the need of (currently lacking) high-quality time series data in development research.

1. Introduction

Running counter global trends, Latin America – one of the most unequal regions in the world – surprised at the beginning of the 21st century with a substantial decline in inequality of income distribution (see e.g. Gasparini & Lustig, 2011; Lustig, Lopez-Calva, & Ortiz-Juarez, 2013). Increases in public social spending are commonly regarded as one of the major driving forces behind this decline (Clifton, Díaz-Fuentes, & Revuelta, 2020; Lustig, Lopez-Calva, & Ortiz-Juarez, 2016; Ocampo & Gómez Arteaga, 2018). In turn, because increases in public social spending coincided with a pronounced commodity price boom from 2003 to 2013, it is widely claimed that rising revenues from commodity exports made this possible. However, the allegedly positive impact of commodity prices on public social spending has been presupposed rather than studied. Against this background, this paper investigates the relationship between commodity prices and public social spending in Latin America over the past two decades.

Using a time series approach, we investigate if we can attribute increases in public social spending on health, education, and social protection to rises in each country's net commodity export prices. We estimate structural vector autoregression models for 16 Latin American countries over the period from 1990 to 2019. Our study finds that two countries experienced lasting increases in public social spending due to the commodity boom (Argentina, Ecuador). Some others observed at least temporary increases of few years (Brazil, Mexico), reacted first with declines and then rises (Chile), and yet others did not respond at all (Bolivia, Colombia, Peru). Expectedly, we cannot relate public social spending with commodity prices in countries without commodity price boom. Overall, our results suggest that there is substantial between-country heterogeneity and no universal transmission from rising commodity prices to higher public social spending. In countries that have seemingly used increased revenues from commodity price booms for public social spending, there is no clear tendency concerning the function of spending that benefits most. We conjecture that the supposed importance of the commodity price boom as enabling factor for the increase in public social spending in Latin America is

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https://doi.org/10.1016/j.worlddev.2024.106717
Accepted 6 July 2024
Available online 22 July 2024

overstated in so far as it was neither necessary nor sufficient for social policy expansion. It is nevertheless plausible that public social spending benefitted from commodity prices in some countries, which leads us to conclude that country-specific determinants of the conditions under which increased policy space is used for public social spending deserve much closer scrutiny.

Our study advances the existing literature in several ways. First, our structural VAR approach allows us to take into account that public social spending on different functions – health, education, and social protection – might react quite differently to commodity price booms, while spending on one function is not independent of spending on the others. While some papers in the literature study impacts of external shocks on different functions of government separately, interdependencies are usually not considered. Second, we expect a high degree of cross-country heterogeneity that pooled or panel approaches may disguise. We conduct country-specific estimations to avoid this problem and indeed find an array of distinct situations in different (groups of) countries. All in all, we provide credible estimates to better understand the relationship between commodity prices and public social spending in Latin America. These results have implications also with respect to the role of the commodity price boom in the reduction of inequality at the beginning of the 21st century: even if we do not directly test the impact of the commodity boom on income inequality in this paper, we investigate one important channel – public social spending – through which such an impact may occur. Like a few other recent studies, we call the central role of commodity prices into question (Arza et al., 2022; Feierherd, Larroulet, Long, & Lustig, 2023).

The paper is organized as follows. Section 2.1 provides some theoretical background concerning the relationship between commodity prices and public social spending, before Section 2.2 discusses previous empirical research. Section 3 presents our empirical approach and data. Section 4 presents and discusses our results. Section 5 closes with a conclusion.

2. Theoretical considerations and previous literature

2.1. Theoretical approaches

It is a widely shared view that Latin American economies benefitted strongly from rising global commodity prices over periods of the past two decades. During what has been called a global commodity "supercycle", lasting from around 2003 to 2012 or 2014 (see e.g. Erten & Ocampo, 2013), Latin American economies faced a "very positive external environment" (Ocampo, Bastian, & Reis, 2018, p. 233; see also Cetrángolo, Ruiz del Castillo, & Jiménez, 2010; Mazzuca, 2013). At the same time, public social spending in Latin American countries expanded (see Section 3.2.1). Bringing these two developments together, much of the literature on social policy and public social spending in Latin America, implicitly or explicitly, highlights the contribution of the commodity boom to social policy expansion (Lavinas, 2013; Martínez Franzoni & Sánchez-Ancochea, 2018). A common take is exemplified by Grugel and Riggirozzi (2018, p. 555), who argue that "[t]he reasons the Left was able to extend welfare and avoid borrowing was the long global commodity boom".

Indeed, the conventional macroeconomic perspective holds that movements in terms-of-trade (ToT) have a substantial impact on macroeconomic performance and short-term fluctuations within the business cycle (Broda, 2004; Céspedes & Velasco, 2012; Fernández, González, & Rodriguez, 2018; Kose, 2002; Mendoza, 1995). Hence it is plausible that commodity price booms also expand a government's room for manoeuvre. Rising commodity prices could increase direct tax revenues from commodity exports as well as non-tax revenues such as royalties and profits from state-owned companies, and result in higher commodity rents in the hands of the state. This seems especially relevant in Latin America, where state-owned companies carry out mining and oil production in some countries. Higher commodity prices may also contribute to higher economic growth by expanding aggregate demand (Ocampo, 2017) or easing balance-of-payments constraints (Rosnick & Weisbrot, 2014). In consequence, governments may see their tax revenues and fiscal space grow, thus easing political and fiscal restrictions on public spending (see e.g. Medina, 2016). Estimates from recent empirical literature suggest that commodity price booms are, on average, important for economic output of commodity-exporting economies, but there is a considerable degree of heterogeneity.[1]

Furthermore, rises in government revenues alone do not imply automatic increases in public social spending, as governments may choose not to allocate the additional fiscal resources towards this objective.[2] A large and interdisciplinary literature has investigated three broad strands of determinants of public social spending (see Flechtner & Sánchez-Ancochea, 2022, for a review with reference to Latin America): a trade and globalization hypothesis that investigates potential impacts of trade openness on government expenditure (e.g. Doyle, 2018; Rodrik, 1998), a modernization hypothesis that investigates the impact of rising living standards and industrialization (e.g. Williamson & Fleming, 1977), and a politics hypothesis that investigates the role of democracy or ideology of incumbent governments (e.g. Hicks & Swank, 1992; Huber, Ragin, & Stephens, 1993).

While this literature seeks to provide general explanations of the level and growth of public social spending, one can also draw on it to investigate the potential impact of commodity price booms in particular. The politics strand offers various potential explanations why additional fiscal resources from commodity booms may not be allocated towards public social spending. The political willingness to do so has been attributed in particular to left-wing governments (e.g. Birdsall, Lustig, & McLeod, 2012; Cornia, 2010; Huber & Stephens, 2012; Madrid, Hunter, & Weyland, 2010; Silva, 2017), although the evidence on this matter has produced mixed results (Altman & Castiglioni, 2019). On the one hand, in societies with high degrees of political polarization or fractionalization of political elites, competing groups may all insist on benefitting their voters, resulting in so-called "voracity effects" with more-than-proportional increases of public social spending (Gavin & Perotti, 1997; Lane & Tornell, 1996; Perotti, 1996; Tornell & Lane, 1999; Woo, 2009). On the other hand, the discretionary power of incumbent governments may be restricted by political decisions of previous governments, for instance when fiscal rules have been imposed on governments' utilization of windfall gains from commodity exports

[1] Roch (2019) estimated that commodity ToT accounted for 29 percent of the fluctuation in economic output in commodity-exporting countries during 1980–2017, on average, with considerable cross-country differences. Fernández, Schmitt-Grohé, and Uribe (2017) found that world price shocks accounted for about one third of variations in domestic economic activity over 1965–2015. Troncoso Sepúlveda (2022) analysed the case of Ecuador and concluded that between 23 and 37 percent of macroeconomic fluctuations could be attributed to commodity ToT. Torres-García, Montoya-Arbeláez, and Wberth-Escobar (2022) analysed five Latin-American countries and found impacts on aggregate output of 29 to 40 percent. In contrast to this group of studies, Schmitt-Grohé and Uribe (2018) estimated that less than 10 percent of fluctuations in economic output were due to ToT shocks, on average, in a sample of 38 countries covering the period 1980–2011. Country-specific estimates for Latin American economies suggested that even in highly commodity-dependent economies, the impact of ToT fluctuations on aggregate economic activity was minor.

[2] In turn, rises in public social spending may also occur without rises in government revenues. Given the ongoing scrutiny surrounding the role of the commodity boom in economic output and the doubts regarding its impact on fiscal space, alternative factors have been examined. Notably, the presence of low interest rates and the availability of international loans could have facilitated the expansion of social policy in Latin America during the early 2000s (Campello, 2015; Dorlach, 2021). These factors may also provide insight into why Latin American countries that did not experience a commodity boom were still able to augment public social spending, even in the face of unchanged or declining ToT (Arza et al., 2022; Feierherd et al., 2023).

for social expenditures (Medina, 2016; Villafuerte, López-Murphy, & Ossowski, 2013). In a similar vein, natural resource funds are often designed to limit governments' decision-making power over windfall gains, by channelling them towards pre-determined purposes that are usually unrelated with social policy.

Drawing on the trade and globalization strand, it might be the case that governments of countries with a higher degree of commodity dependence and hence exposure to price volatility observe a larger political need to compensate voters for risks that economic openness may entail, as stated by Rodrik (1998). Concerning the modernization and growth strand, one may expect that additional fiscal resources are more likely to be used for public social spending in richer economies because of higher voter demands for social policy. Furthermore, it might be easier for richer and more diversified economies to use windfall gains from commodity booms to get increases of public social spending going, especially with longer-lasting increases in mind. The reason is the minor relative economic importance of these windfall gains in comparison with smaller, commodity-dependent economies. Whereas these latter economies must be careful not to increase public social spending without securing funding for the longer term, more diversified economies might find it easier to use temporary increases in revenues to bring public social spending to higher levels with the aim of securing funding from other sources in the medium term. Here, it is important to note that economic growth and augmented fiscal space do not inherently lead to an automatic expansion of social spending, as documented by historical analyses (Bértola & Ocampo, 2012; Prados de la Escosura, 2007).

From a theoretical angle, different functions of governments' social spending may respond differently to fluctuations in the business or commodity cycle (Martínez Franzoni & Sánchez-Ancochea, 2021). Some functions, such as unemployment insurance, often exhibit a countercyclical nature, primarily due to the presence of automatic stabilizers. In Latin America, automatic stabilizers have historically played a relatively minor role though (Arze del Granado, Gupta, & Hajdenberg, 2013). Conversely, public spending on education is commonly perceived to exhibit procyclical behaviour: in times of economic affluence governments are more inclined to increase spending on education, while they may reduce it during times of crisis (Delaney & Doyle, 2011). Public health expenditure is closely intertwined with the health status of the population and tends to exhibit an inverse relationship. The business cycle can have procyclical (Bellés-Obrero & Vall Castelló, 2018; Neumayer, 2005) and countercyclical effects (Darby & Melitz, 2008; Tapia Granados, 2005) on the population's health. Still, political processes and borrowing constraints contribute to procyclical health spending in developing (Liang & Tussing, 2019) and OECD countries (Abbott & Jones, 2021).

To conclude theoretical considerations, it remains *a priori* uncertain what impact a commodity boom will likely have on public social spending. Even when a commodity boom does expand governments' fiscal space, it is uncertain that this additional fiscal capacity will be allocated towards public social spending, and it might be the case that different functions of government respond differently. Still, it is not implausible to assume links between the commodity boom and growing public social spending in Latin America, which makes empirical analysis indispensable.

2.2. Previous empirical literature

To the best of our knowledge, no empirical analyses of our research question have been proposed, but there are a few related studies that can inform the discussion. Using vector autoregression models, Medina (2016) analyses the effect of commodity price changes on primary government revenues and government expenditures in eight Latin American countries during 1995–2013. He finds a uniformly positive response of government revenues to price shocks, but rather heterogeneous response patterns of government expenditure. The analysis does not focus on social spending in particular. Villafuerte et al. (2013) study the fiscal policies of seven non-renewable-resource-exporting countries in Latin America and the Caribbean during the boom period 2003–2008 and find that most countries relaxed their fiscal policies during price boom times and exhibited a procyclical behaviour, but they became more heterogeneous after the boom. The authors attribute cross-country heterogeneity in fiscal policy partly to different fiscal rules and guidelines. Altman and Castiglioni (2019) study the effect of economic growth – which they place in the context of the commodity boom – on the expansion of equitable social policy over the commodity boom period. They analyse data from 18 Latin American countries over the period 1990–2013 using panel estimations and find that economic growth had no effect on equitable social policy – which is a different concept from public social spending. Fairfield and Garay (2017) conduct a qualitative comparison of Chile and Mexico, that shows how higher tax revenues from commodity exports were translated into higher social spending. According to their analysis, social policy demands created pressures on the tax front, while higher commodity prices weakened the influence of the business elite on social policy.

Studies using global data also reach conclusions that emphasize cross-country heterogeneity. Spatafora and Samake (2012) study the effect of commodity price increases on government spending on health and education, using a sample of 116 countries over the period 1990–2010. Based on cross-country panel regressions, they find that social expenditure rose strongly in response to commodity export prices, especially in low-income countries that relied on commodity exports. Arze del Granado et al. (2013) analyse public spending on health and education in 145 countries over the period 1987–2007 and also find that these types of spending were pro-cyclical in developing countries. Jalles (2020) investigates the cyclicality of different types of social spending in 45 developing economies from 1982 to 2002 and obtains a different result: education, health and social protection all behaved acyclically, whereas pensions showed a procyclical behaviour. However, there was considerable heterogeneity across countries and many individual countries violated common trends.

Overall, there is some evidence that commodity price booms have translated into higher public social spending in some countries, but not in others. As reasons for this heterogeneity, authors have suggested fiscal rules and fiscal regimes as well as different political coalitions, as far as discretionary spending or amendments of fiscal rules are concerned. So far, to the best of our knowledge, there are no studies which examine the link between commodity prices and public social spending in Latin America, taking into account differences within the region, as well as different functions of social spending.

3. Empirical approach and data

3.1. Estimation strategy

We carry out country-wise structural vector auto-regression (SVAR) estimations to analyse the responses of public social spending on three main functions – education, health and social protection – to increases in commodity ToT.[3] It is investigated if there are differences in responses across countries and across the different functions of social spending. We use annual time series data on public social spending on education, health and social protection in 16 Latin American countries from 1990 to 2019 (see Table 1 and Section 3.2 below). To the best of our knowledge, all previous studies that have looked into different functions of public social spending have treated these outcome variables as independent from each other. In contrast, we think that spending on the different functions is not independent since

[3] A replication package with raw data and code to reproduce data cleaning and analysis is available at https://github.com/svenjafl/socialspending_replication.

higher spending on one function reduces the budget for the others. To take this dependency into account, we employ a SVAR model in which dependent variables are regressed on their past observations as well as the past observations of the other dependent variables (Baum, 2006).[4] Country-by-country estimations are conducted instead of panel estimations as several studies indicate that there is strong heterogeneity in social spending across countries (e.g. Jalles, 2020, 2021; Medina, 2016). In panel estimations, this heterogeneity might lead to positive and negative reactions that cancel each other out, and results might not be very telling (Flechtner & Gräbner, 2019). We therefore choose to estimate a simple SVAR for each country. We follow closely the approach and the notation by Schmitt-Grohé and Uribe (2018):

$$\mathbf{A}_0 x_t = \mathbf{A}_1 x_{t-1} + \mu_t \tag{1}$$

in which the vector x_t is given by

$$x_t \equiv \begin{bmatrix} cp_t \\ edu_t \\ hlt_t \\ sp_t \end{bmatrix}$$

The variables cp_t, edu_t, hlt_t, sp_t represent the logarithmised values of the levels of the commodity ToT index, education spending, health spending, and social protection spending, respectively.[5]

$\mathbf{A}_0$ and $\mathbf{A}_1$ are 4×4 matrices of coefficients, whereby $\mathbf{A}_0$ is lower triangular with 1 on the main diagonal. μ_t is a 4×1 random vector which has a mean of 0 and a diagonal variance–covariance matrix Σ. When multiplying the formula by $\mathbf{A}_0^{-1}$, it can be written as:

$$x_t = \mathbf{A} x_{t-1} + \Pi \varepsilon_t \tag{2}$$

where

$$\mathbf{A} \equiv \mathbf{A}_0^{-1}\mathbf{A}_1, \quad \Pi \equiv \mathbf{A}_0^{-1}\Sigma^{0.5}, \quad \varepsilon_t \equiv \Sigma^{-0.5}\mu_t$$

The vector ε_t is a random variable with mean zero and identity variance–covariance matrix. In accordance with a large literature (e.g. Broda, 2004; Fernández et al., 2017; Gruss & Kebhaj, 2019; Medina, 2016; Raddatz, 2007), we assume that countries are price-takers on global commodity markets, which allows us to treat commodity ToT indices as exogenous from the perspective of single countries. Therefore, we specify the commodity ToT variable in our model as exogenous to changes in the different types of social spending, which are the three endogenous variables of the SVAR. This restriction implies that all elements of the first row of $\mathbf{A}_1$ are zero, except the first element. Under these conditions, the first equation of the SVAR system (2) represents the law of motion of commodity ToT and can be represented by

$$cp_t = \alpha_{11} cp_{t-1} + \pi_{11}\varepsilon_t^1. \tag{3}$$

α_{11} and π_{11} describe the elements (1, 1) of $\mathbf{A}$, respectively Π. The first element of ε_t, ε_t^1 can be interpreted as a commodity ToT shock because it is the only contemporaneous effect on the commodity ToT, as all elements except the first of $\mathbf{A}_0$ are zero.

The model is a simple SVAR in the sense that due to the Cholesky decomposition, there are no contemporaneous interaction effects between the endogenous variables. Consequently, the endogenous variables are affected by past observations of themselves and the other endogenous variables, but not by the contemporaneous observations of the other endogenous variables. In this setup, and as we are only interested in the effect of the commodity ToT shock on the endogenous variables, the order of the latter has no effect on our results (Drechsel & Tenreyro, 2018; Schmitt-Grohé & Uribe, 2018). To account for our relatively small sample size with a maximum of 30 observations per country, we make small-sample degree-of-freedom adjustments and report small-sample t and F statistics (Baum, 2006). We also include only one lag due to the small sample size. For the majority of the countries in the sample, different lag-order selection criteria favoured one lag over two lags. The estimated SVARs are stable for all countries.[6] We then estimate impulse response functions (IRF), which we report as our main results in Section 4.1. For robustness, we also estimated IRFs via local projections (Jordà, 2005). When SVARs are well-specified, IRFs from SVARs and local projections should resemble closely, thus making LP estimation a useful robustness test (Plagborg-Møller & Wolf, 2021).

3.2. Data

Our analysis uses two main variables: public social spending and commodity ToT. We present the data sources used to measure these variables alongside descriptive statistics in the following subsections.

3.2.1. Public social spending in Latin America since 1990

We rely on public social spending data obtained from the Economic Commission for Latin America and the Caribbean (ECLAC). It is important to note the scarcity of comparable, comprehensive, and extensive public social spending data for Latin American economies. A significant challenge arises from the decentralized nature of public social spending, with different levels of government handling various functions such as education or healthcare separately or jointly. Moreover, these responsibilities may change over time, and lead to further complexity in data collection and analysis (Martínez & Collinao, 2010).[7] Unfortunately, many data sources do not provide clear indications of the government level(s) from which they gather information, sometimes even combining data points from different levels into a single time series. As a result, it is challenging to compare countries and track changes over time (see Flechtner & Sánchez-Ancochea, 2022, for a detailed discussion).

Given all the limitations, we consider the annual public social spending data published by ECLAC to be the most reliable data source. It comprises information on public social spending in per-capita and percentage terms. ECLAC's data collection distinguishes four levels of government spending: central government, general government, financial public sector spending, and non-financial public sector spending. In some instances, data on spending from multiple government levels is available for certain countries and years. Unfortunately, for the majority of countries, data is only available for central government (CG) spending, or the CG time series provides more data points. With the exception of Argentina and Peru, we end up utilizing information from this level. We consider the lack of more comprehensive data a central

[4] Because most of the literature investigates the types of social spending separately, we also estimated bivariate SVARs, in which each type of social spending is regressed only on the commodity price, to test for the robustness of our approach. Overall, the results remain unchanged. The only case in which we observe slight changes is Brazil: the small and short-lasting responses of per-capita spending on education and health disappear. The respective IRFs can be found in appendix C.1.

[5] The use of log levels is similar to e.g. Drechsel and Tenreyro (2018).

[6] It is not necessary that all variables of the SVAR be stationary, but the SVAR as a whole. To confirm this, we report results from the eigenvalue stability condition in appendix B. We further report results from the Lagrange multiplier test for autocorrelation in the residuals.

[7] The use of central government spending is particularly problematic in countries with federal structures, where social spending is decentralized. In Brazil, for example, the federal government spent less than 60 percent of public social spending, while state governments and municipalities were responsible for 23 percent and 20 percent, respectively. In Argentina in 2003, 53 percent of total public spending was attributed to the national government, 40 percent to provinces and 7 percent to municipalities (ECLAC, 2007, 127). Since the beginning of our period of study, many Latin American countries have undergone decentralization reforms. As a result, even in non-federal countries like Bolivia or Colombia, sub-national governments account for over 70 percent of public spending in education and about 50 percent in health (Brosio & Jiménez, 2012).

Table 1
Public social spending data for Latin American countries, 1990–2019.

Country	Spending level	Period	Public social spending			
			% GDP		per capita	
			First year	Last year	First year	Last year
Argentina	NFPS	1990–2019	15.5	27.2	1267.7	3159.97
Bolivia	Central Gov.	1990–2019	5.1	12.4	96.3	442.8
Brazil	Central Gov.	1990–2019	13.0	17.3	735.1	1593.2
Chile	Central Gov.	1990–2019	12.1	17.4	677.2	2725.8
Colombia	Central Gov.	1990–2019	2.8	12.5	109.1	854.2
Costa Rica	Central Gov.	1993–2019	7.5	11.9	497.1	1504.5
Dominican Republic	Central Gov.	1990–2019	4.0	7.7	101.0	643.1
Ecuador	Central Gov.	1990–2015	2.9	8.6	131.8	480.2
El Salvador	Central Gov.	1990–2019	2.9	8.6	72.4	356.7
Guatemala	Central Gov.	1991–2019	2.4	7.8	76.9	339.3
Honduras	Central Gov.	1990–2015	6.5	8.9	120.5	203.9
Mexico	Central Gov.	1999–2019	5.8	9.2	484.8	883.5
Nicaragua	Central Gov.	1990–2019	6.5	10.7	80.0	205.0
Panama	Central Gov.	2000–2019	8.4	8.9	611.8	1397.2
Paraguay	Central Gov.	1990–2019	3.2	9.6	102.2	546.1
Peru	General Gov.	1999–2019	9.3	11.0	313.2	778.1
Uruguay	Central Gov.	1990–2019	6.1	16.1	568.3	3019.0
Venezuela	Central Gov.	1997–2014	9.7	18.8		

Data: ECLAC (2017) and (2023). Per-capita spending is measured at constant prices in US dollars of 2010.

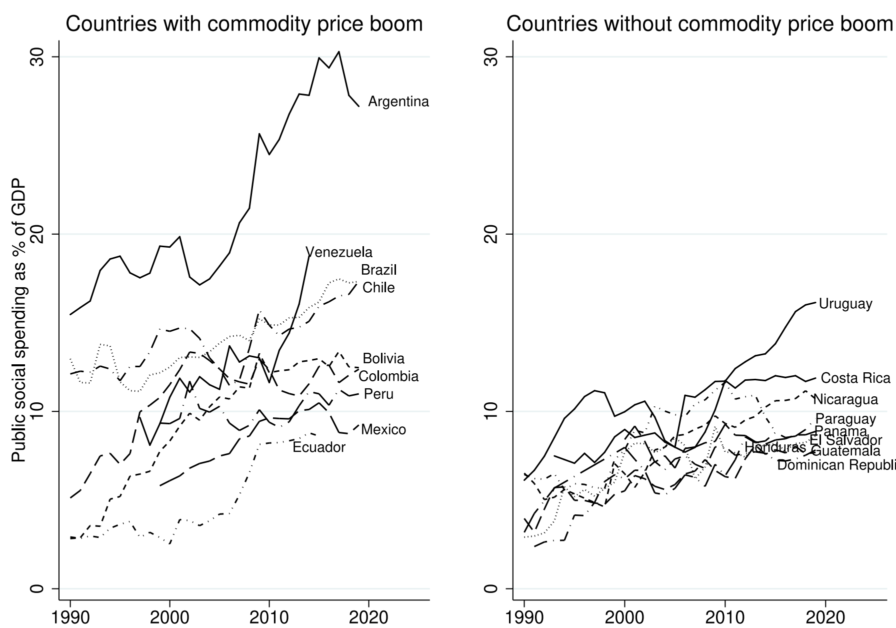

Fig. 1. Public social spending in Latin America, % of GDP, 1990–2019.
Data source: ECLAC. Please see Table 1 and appendix E for details on individual country's time series and note that all time series show Central Government spending, except for Argentina (Non-financial public sector) and Peru (General Government).

limitation of our study that is not easily solved in the foreseeable future. Table 1 outlines the specifics of the time series we utilize. Generally, we have comparable data from 1990 to 2021, although some countries have shorter time series or data gaps. In the analysis, we include data until 2019 only, in order to end before the Covid-19 pandemic. As this observation period is already relatively short, only the results for countries with complete time series should be interpreted with confidence. We report results for Ecuador (1990–2015), Mexico (1999–2019) and Peru (1999–2019), but emphasize that these should be interpreted with caution. Due to incomplete data, we could not derive any results for Venezuela. In general, in comparison to earlier studies, this paper entails the advantage of including more post-boom years, allowing for a better analysis of potential longer-lasting effects of commodity price increases on public social spending.

Over the past decades, most Latin American countries have experienced a joint upward trend of public social spending. Figs. 1 and 2 show that spending levels have increased across the whole region, both in per-capita and in percentage of GDP terms. While increases have clearly been much stronger in some countries than in others, virtually no country has stagnated. The group of boom economies is more heterogeneous in itself than the non-boom countries, owing partially to the rather similar Central American economies in the latter group. If one assumes that additional fiscal resources from the commodity boom have a role to play in explaining the social policy expansion, the high degree of heterogeneity among boom countries – especially in contrast to the other group – could be read as an early indicator that commodity resources are only one factor among several.

While this big picture refers to total public social spending, our analysis differentiates public social spending by function of government and focuses on public spending on education, health, and social protection. In all countries of our sample, these three functions account for the bulk of total social spending. Spending in the other categories considered in

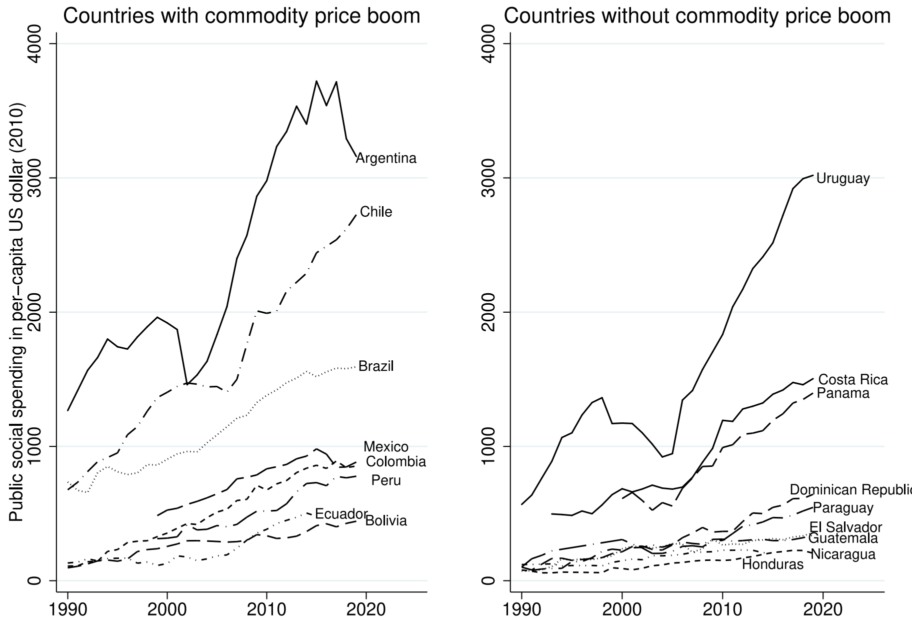

Fig. 2. Public social spending in Latin America, per capita (US dollar), 1990–2019
Data source: ECLAC. Please see Table 1 and appendix E for details on individual country's time series and note that all time series show Central Government spending, except for Argentina (Non-financial public sector) and Peru (General Government).

the ECLAC dataset – environmental protection, recreation, culture and religion, and housing and community amenities – is mostly marginal and there are many missing values; therefore, we excluded them. Social protection accounts for the largest share of total spending in about half of the countries, while education occupies the first rank in the other half. In terms of growth trends over time, there is quite some heterogeneity. When focusing on public social spending as percentage of GDP, for example, some countries observed increases (e.g. Argentina, Ecuador, Peru) of spending on health, while the share more or less stagnated in others (e.g. Brazil, Costa Rica, Panama). Within countries, it is common for one function to grow relatively while others stagnate or even decrease. For example, the percentage of spending on social protection in GDP decreased over the past 20 years in Peru, while the shares of education and health grew. In Mexico, the share spent on education increased and then decreased, while social protection grew and health remained more or less stable. Detailed descriptive statistics by country and function of spending are presented in appendix E.

In our analysis, we consider public social spending measured in per-capita terms as well as measured as percentage of GDP. Both measures are common and have been used in previous literature, most often without further consideration, even though each may represent a different scenario (see e.g. Flechtner & Sánchez-Ancochea, 2022). During a commodity price boom, net exports experience an increase, subsequently stimulating economic growth and expanding public budgets. As a result, this expansion may lead to an expansion of per-capita public social spending. However, such dynamics do not necessarily imply a proportional increase in public social spending as a percentage of GDP. A rise in the percentage of spending would require not only per-capita increases but also a larger relative allocation of the growing GDP towards public social spending. In other words, public social spending would need to grow more than proportionately.

3.2.2. *Commodity prices*

It is commonly understood that Latin America has been affected by the 2003–2013 commodity boom as a region. However, experiences in each country differed considerably from one another. This heterogeneity stems from different export and production structures: individual economies rely on different commodities whose prices have behaved rather differently (Gruss & Kebhaj, 2019). Even though commodity prices tend to be correlated, this does not translate into correlations of commodity ToT indices in cross-country comparison (Cashin, McDermott, & Scott, 2002; Gruss & Kebhaj, 2019). Moreover, commodity exports play different roles in the countries' total exports. Some countries rely rather heavily on (sometimes only a few) commodities and some have more diversified export structures, while commodity dependence also varies over time. The share of commodities in total exports – and hence exposure to global price cycles – varies from around 25% in Mexico to nearly 90% in Venezuela (see table A.1). Finally, some Latin American countries are also importers of commodities that experienced price hikes. As a result, their experiences have been rather diverse overall. As Fig. 3 shows, about half of Latin American countries experienced declining or fairly constant ToT changes during the boom phase of 2003 to 2013. Among boom countries, there is also some heterogeneity with respect to ToT growth curves. A table listing boom and non-boom countries is available in the appendix (table A.2).

To do justice to country-specific heterogeneity, our analysis utilizes the International Monetary Fund's net commodity terms-of-trade index developed by Gruss and Kebhaj (2019).[8] This index comprises time-varying information about import and export baskets in each country. This is advantageous because even though specific countries can often be related with one dominant export commodity – such as copper in Chile –, the overall composition of production and exports is usually rather unstable and tends to fluctuate considerably over time (Daruich, Easterly, & Reshef, 2019). Because prices of different commodities vary, the ToT developments of individual countries are very heterogeneous and hardly captured by a global price index. To corroborate this point, we report a correlation matrix of the country-specific commodity ToT index that we use with a global commodity price index created by Jacks (2019) (table A.3 in the appendix). The country-specific indices are highly correlated with the global index in some countries (with the highest correlation coefficients observed in Colombia (0.95), Ecuador (0.91) and Mexico (0.84)) but less so in others (0.73 in Bolivia and

[8] We use the version of the index that weights the value of each commodity's net export as share of total trade.

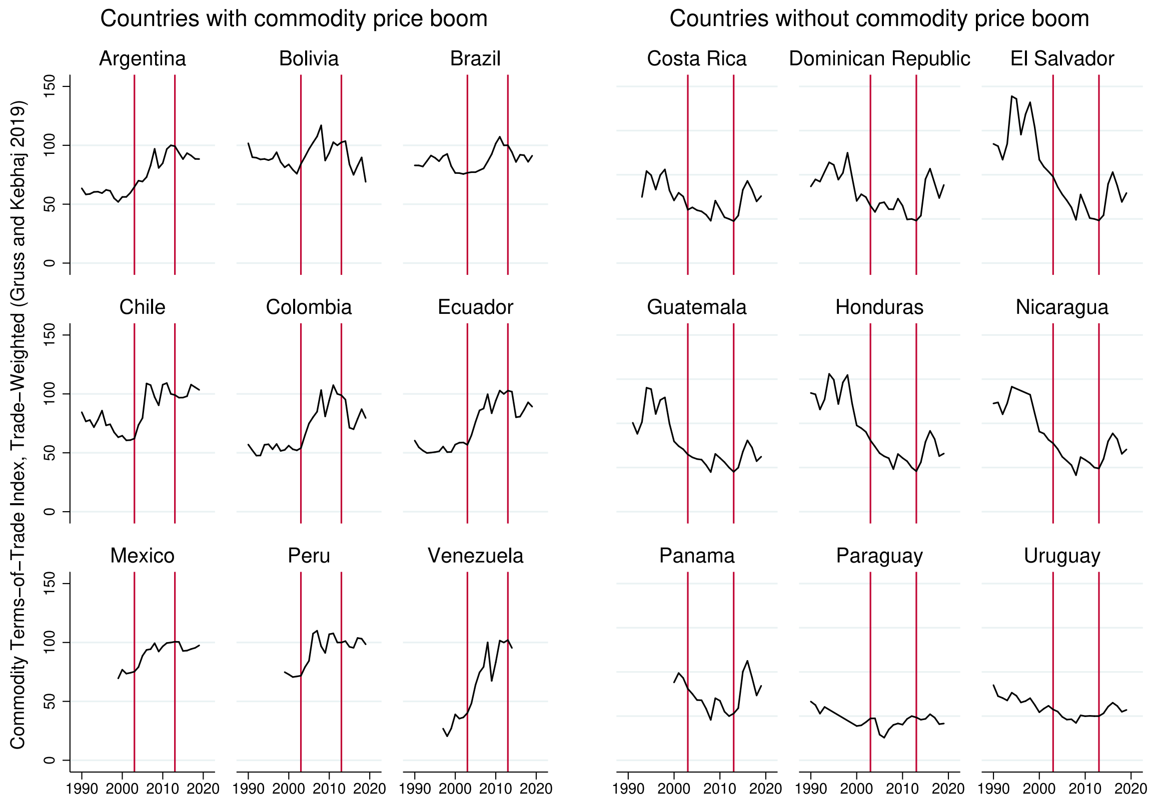

Fig. 3. Commodity terms-of-trade in Latin America, 1990–2019.

Peru, 0.74 in Chile, 0.49 in Brazil). Also, the country-specific indices are often only weakly correlated among themselves, indicating considerable heterogeneity across countries.

4. Empirical findings

4.1. Results

In this section, we present graphs of the IRFs estimated on the basis of SVARs fitted as outlined in the previous section. Point 0 on the horizontal axis represents the moment of a positive shock in commodity ToT, and the following numbers indicate the years since this positive shock has passed. The shaded areas in the graphs illustrate the 95% confidence intervals of the IRFs.[9] Figs. 4 to 11 show the results for eight of the nine countries that experienced a commodity price boom. As previously noted, results for Ecuador, Mexico and Peru should be regarded with caution due to shorter time series, and Venezuela was excluded altogether. Results for the remaining, non-boom countries are presented in appendix D. We do not find statistically significant effects of commodity ToT on public social spending in the non-boom countries, with only one minor exception in Uruguay, which is in line with theoretical expectations.

In Argentina, we find that both percentage and per-capita spending react positively and lastingly to commodity ToT rises in all three functions of public social spending. We refer to lasting increases when a rise in spending as a response to rising commodity ToT is maintained for several years. In the case of Argentina, we estimate that a peak in the increase of public social spending is reached only after about five years. Education, health and social protection behave similarly not only regarding the shape of their response functions but also the responses' magnitude.

In Bolivia and Colombia, we observe no significant reactions of public social spending to commodity ToT.

In Brazil, per-capita spending on education and health experiences a temporary increase after commodity ToT increases. We refer to temporary increases when spending reaches a peak after one or two years already, and then quickly tempers down to previous levels. The magnitude of the temporary effects in Brazil is smaller than in Argentina. We observe no statistically significant reaction of the percentage of GDP spending, which implies that per-capita rises keep the pace with GDP growth but leave the share of GDP devoted to public social spending unchanged. For social protection, we observe no statistically significant responses.

In Chile, we observe initially statistically significant negative reactions – that is, drops in both per-capita and percentage spending – in all three functions of spending. Thereafter, however, spending levels recover very quickly. For per-capita spending on health and education, the responses even turn positive after a few years. The pattern is initially similar for social protection, but here the recovery after the drops does not lead to increases above previous levels. The magnitude of all effects is relatively small, hence comparable to the responses in Brazil.

Results for the remaining three countries should be regarded with caution because of shorter time series. In Ecuador, there is a positive and lasting reaction in education and health spending, both in per-capita and percentage terms. The pattern resembles the experience of Argentina, with an increase that peaks after four to five years and tempers down thereafter. Social protection is boosted with a particularly steep upswing. The effect lasts nearly as long as for the other functions and the magnitude of the response is more than twice as strong.

In Mexico, we observe long-lasting positive responses of public spending on health and social protection, both per-capita and as percentage of GDP. Health starts off earlier but also falls back earlier,

[9] Several other studies using IRFs illustrate 90% or even lower confidence intervals (e.g. Medina, 2016; Roch, 2019; Schmitt-Grohé & Uribe, 2018). We report the 95% interval as it is more precise and the common level of statistical significance.

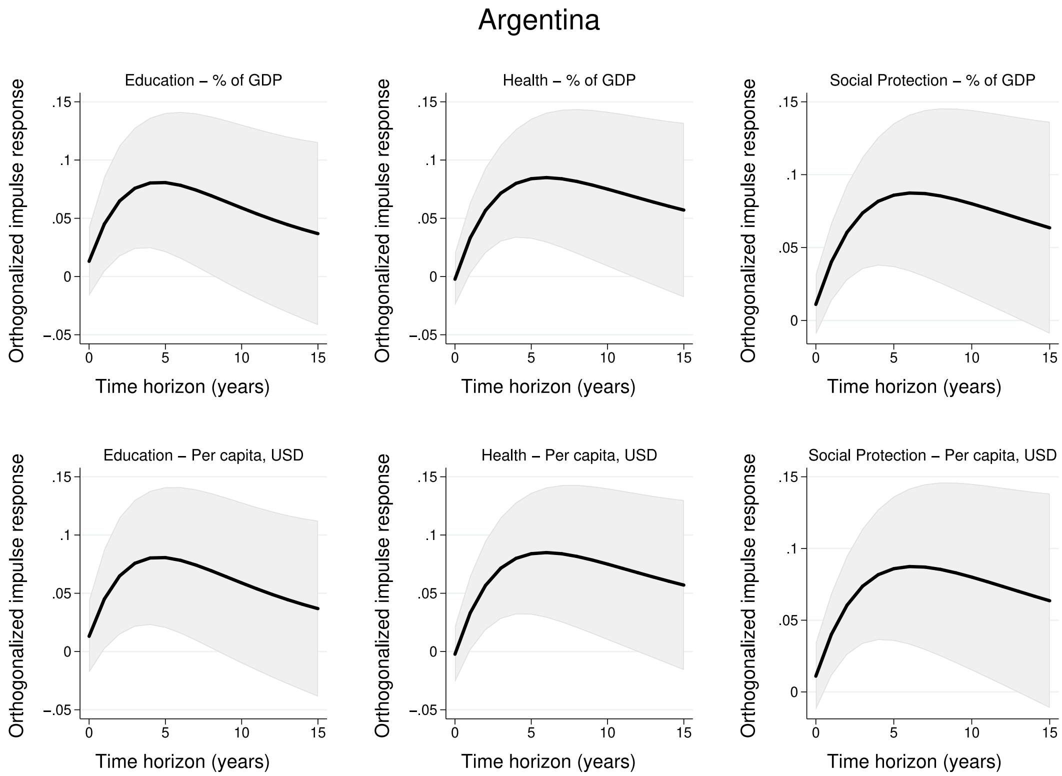

Fig. 4. Impulse response functions of public social spending, by category, to a one-standard deviation commodity ToT shock, in % - Argentina (NFPS).

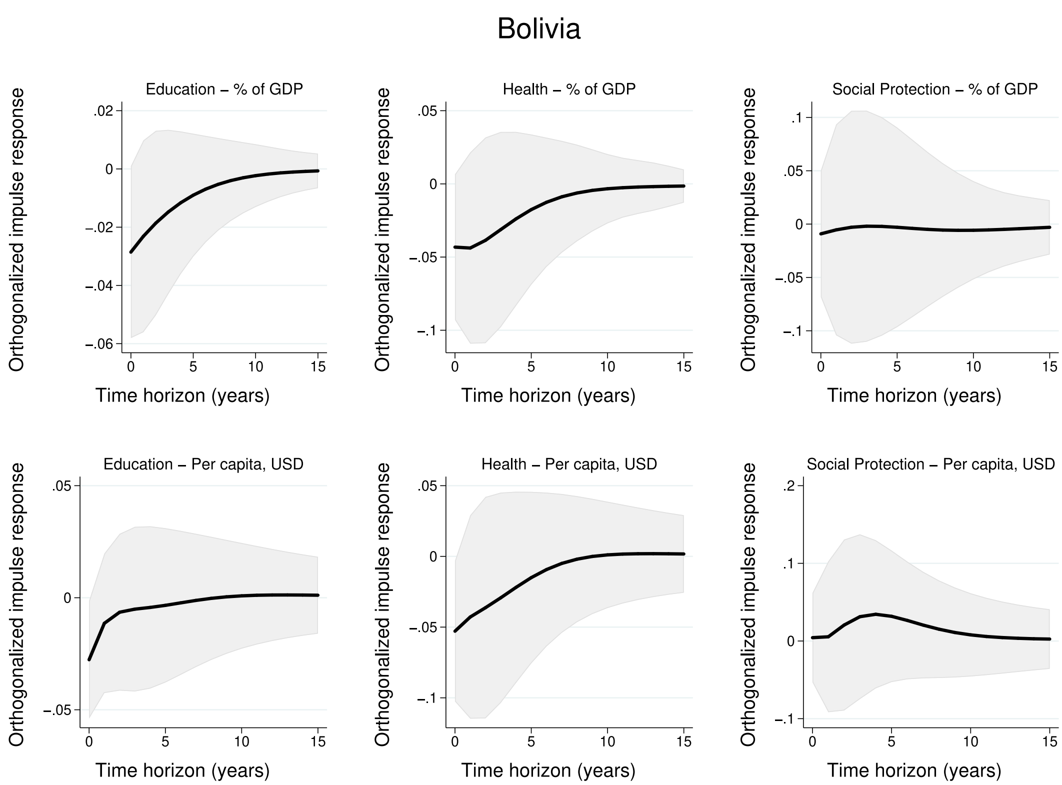

Fig. 5. Impulse response functions of public social spending, by category, to a one-standard deviation commodity ToT shock, in % - Bolivia (Central Government).

after about seven to eight years. Social protection increases appear with a short delay but are maintained even longer. The magnitude of the effects on health and social spending is larger than in Chile and Brazil. Results for education spending are hardly ever statistically significant.

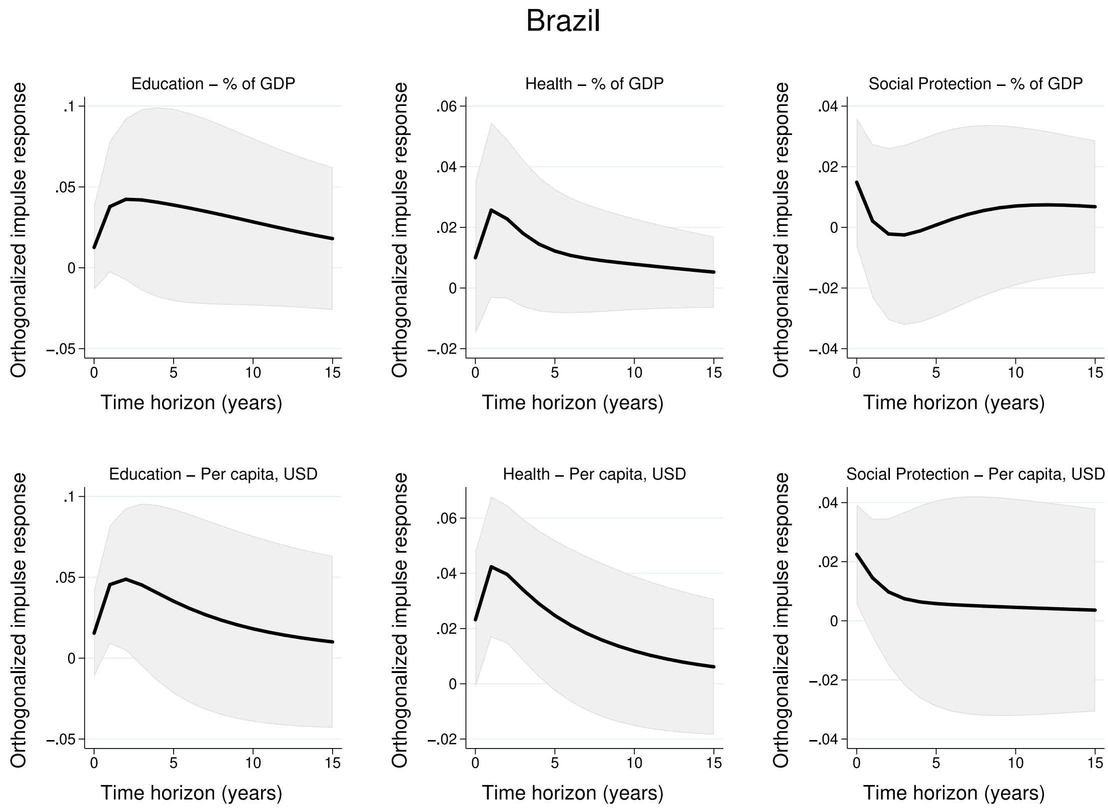

Fig. 6. Impulse response functions of public social spending, by category, to a one-standard deviation commodity ToT shock, in % - Brazil (Central Government).

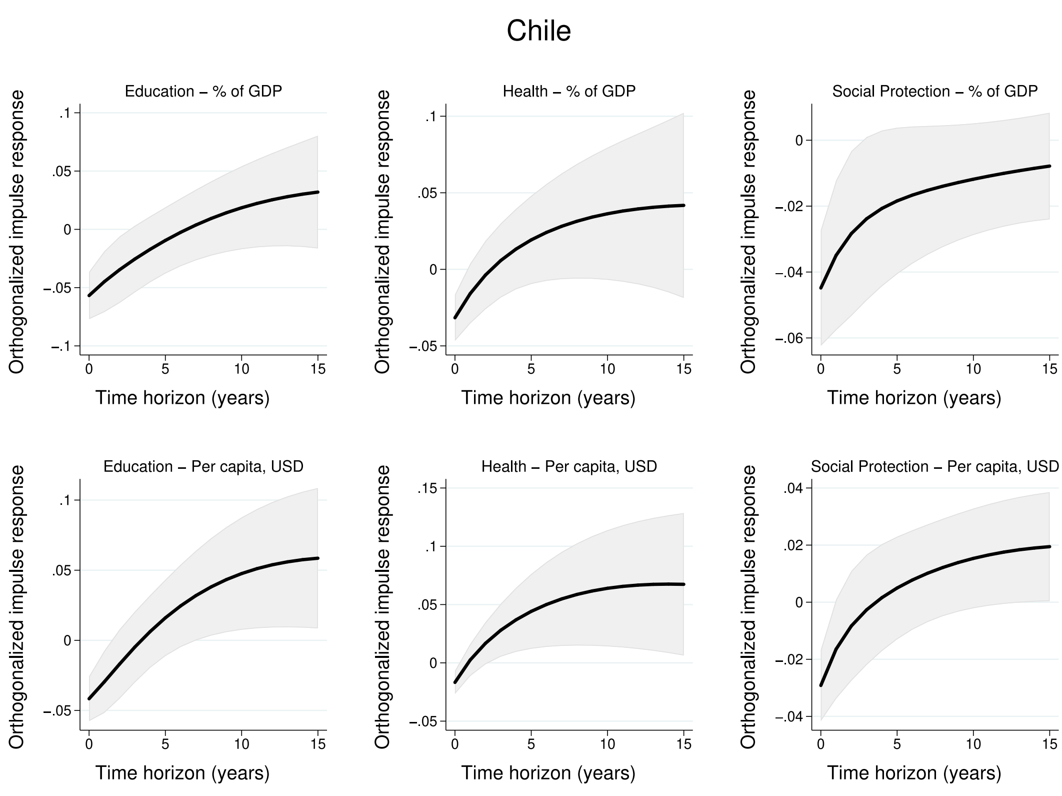

Fig. 7. Impulse response functions of public social spending, by category, to a one-standard deviation commodity ToT shock, in % - Chile (Central Government).

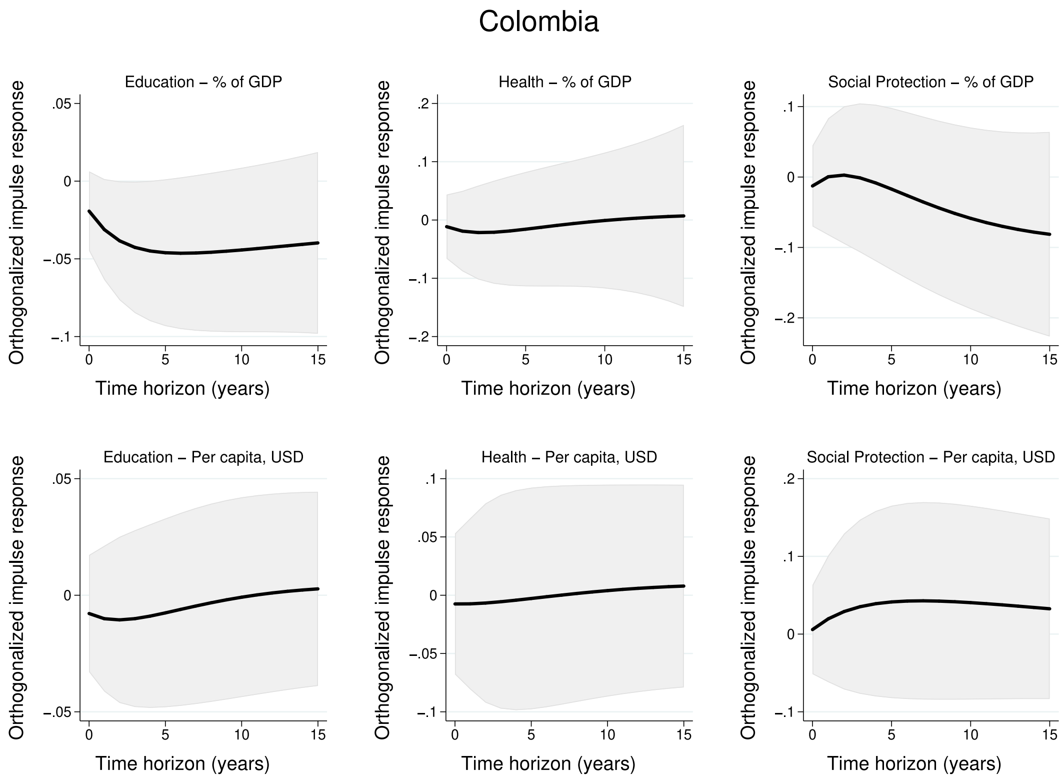

Fig. 8. Impulse response functions of public social spending, by category, to a one-standard deviation commodity ToT shock, in % - Colombia (Central Government).

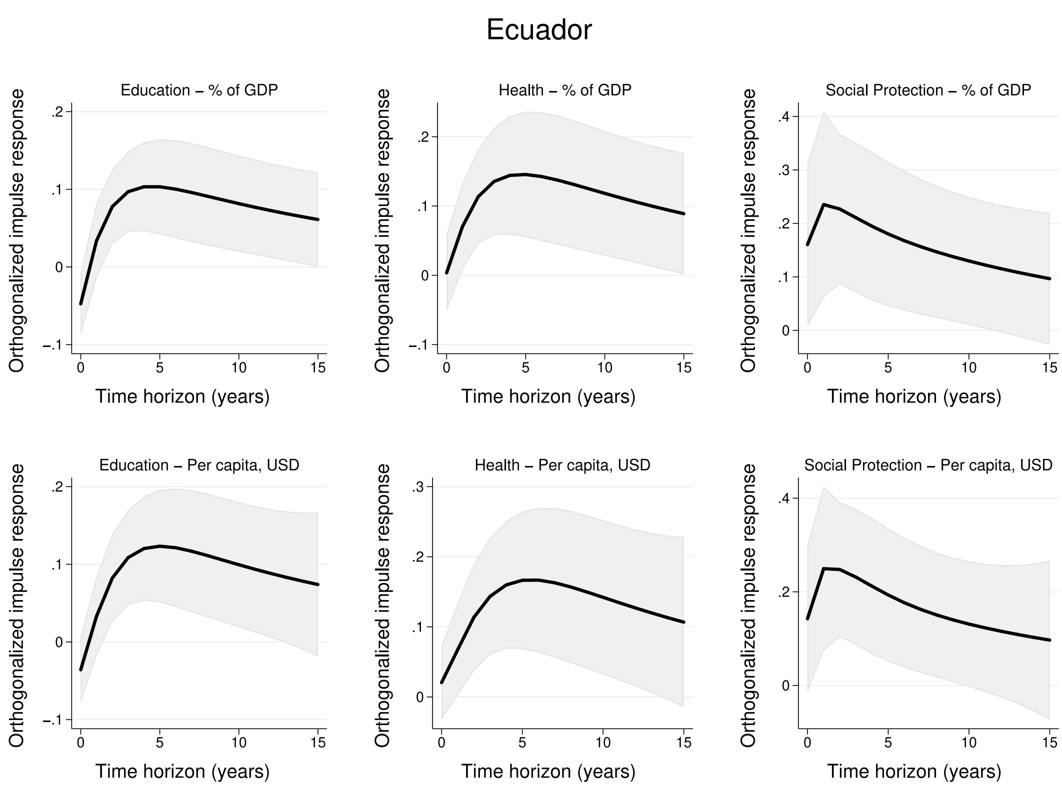

Fig. 9. Impulse response functions of public social spending, by category, to a one-standard deviation commodity ToT shock, in % - Ecuador (Central Government).

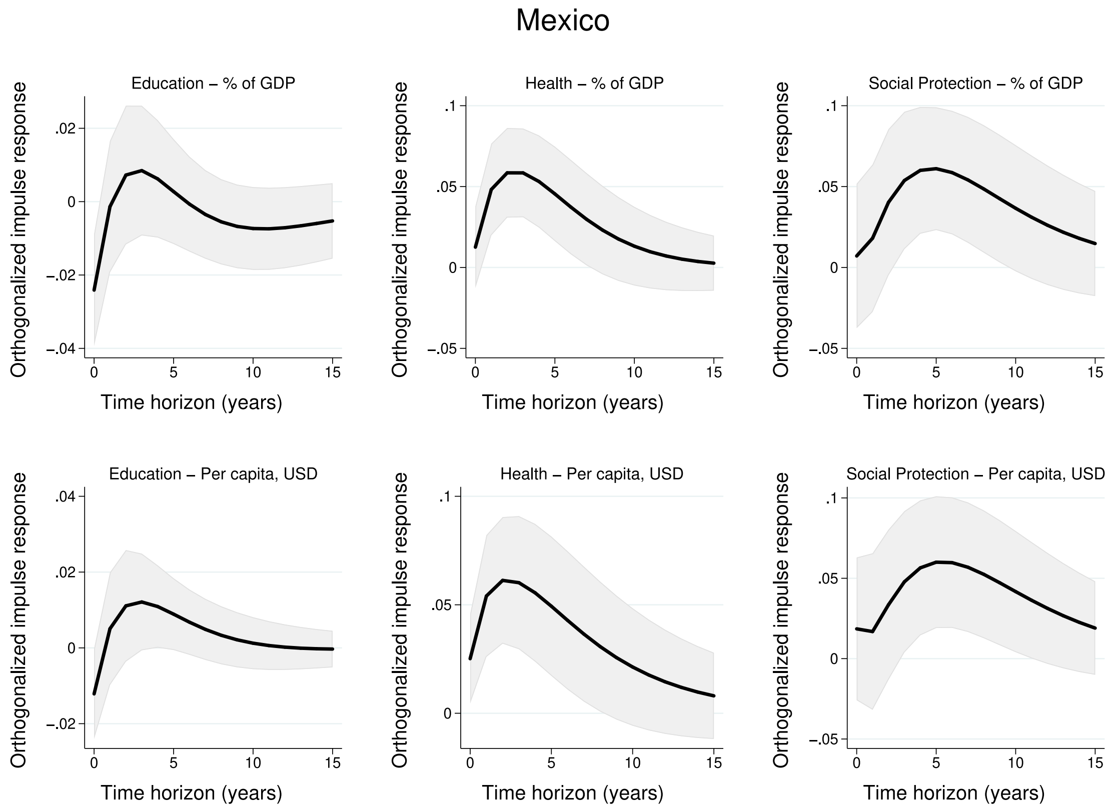

Fig. 10. Impulse response functions of public social spending, by category, to a one-standard deviation commodity ToT shock, in % - Mexico (Central Government).

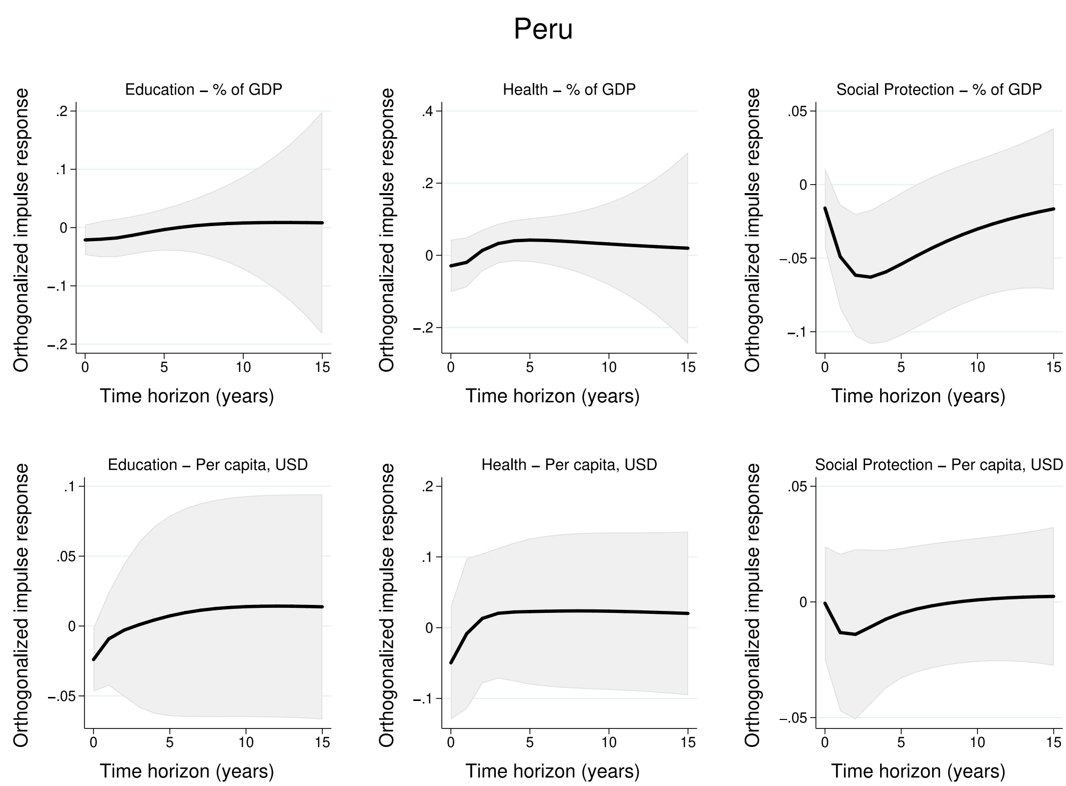

Fig. 11. Impulse response functions of public social spending, by category, to a one-standard deviation commodity ToT shock, in % - Peru (General Government).

In the case of Peru, education and health show no significant reaction to a commodity ToT shock. Spending on social protection measured as percentage of GDP drops three to five years after the shock, before previous spending levels are recovered.

4.2. Robustness checks

4.2.1. Local projections

For the five boom countries with complete time series covering the period 1990–2019 – Argentina, Bolivia, Brazil, Chile and Colombia – , we estimate IRFs via local projections (LPs) for robustness. These results are reported in appendix C.2. Unfortunately, time series are too short to estimate LPs for the remaining commodity boom countries (Ecuador, Mexico and Peru). Overall, the IRFs for the SVARs are smoother than for local projections. Results are identical for Bolivia, Chile and Colombia, while two differences are worth mentioning. First, in Argentina, the positive and long-lasting responses of public social spending occur later than estimated by the SVARs, as of period three to four after the shock. Second, the positive and quick response of public health spending per capita in Brazil is not replicated. In turn, while the SVAR does not estimate substantial effects on education spending in Brazil, the LP approach estimates positive short-term hikes in both per-capita and percentage spending on education. The deviations in selected functions of spending in Argentina and Brazil suggest that these specific results should be taken with a grain of salt and deserve further scrutiny. Overall, however, we think that our main results are replicated to a reasonable degree.

4.2.2. GDP per capita as control variable

A country's GDP strongly impacts government revenues and the fiscal space. While commodity ToT can certainly be one important driver of GDP in commodity-dependent countries, many other economic developments will potentially influence GDP as well, and increase or decrease the fiscal scope for public social spending. Furthermore, it might theoretically be the case that countries increase their level of public social spending as their GDP grows, along with growing voter demand for social policy. By controlling for GDP per capita, we take other possible drivers of public social spending into account and test if we – wrongly – attribute GDP effects to commodity ToT. In our specification, commodity ToT remain exogenous whereas GDP per capita is influenced by the commodity ToT as well as by past observations of social spending. Results are reported in appendix C.3. The IRFs of the different functions of social spending to a shock in commodity ToT remain very similar to the baseline estimation, with a few minor differences. For Peru, the effects in per-capita spending of all three functions, which are insignificant in the baseline estimation, become slightly positive five years after the shock. In addition, we observe a new small short-term drop on percentage spending on education. For Brazil, the short and small positive effect on education (per capita) in the baseline estimation becomes insignificant. Finally, for Chile, spending on education and health (in percentage of GDP) remains negative in the first periods after the shock as in the baseline estimation but then becomes significantly positive in later periods. For all other countries and functions of public social spending, the responses remain similar to the baseline estimations. Overall, we conclude that results are largely robust to the inclusion of GDP per capita and that commodity ToT have a particular effect that is not captured by taking only aggregate economic development into account.

4.2.3. Interest rates as control variable

Besides commodity ToT, a government's fiscal space can be influenced by access to credit. When interest rates are lower, governments can finance expenditures at a lower cost. Even though fiscal rules might constrain the possibility of credit-led fiscal expenditure, it is still plausible that lower interest rates could lead to higher social spending, ceteris paribus. At the same time, rising commodity ToT may increase the value of a country's collateral and thereby lower the interest rate cost. To test if we – wrongly – attribute interest rate effects to commodity ToT, we include interest rates as a control variable in another robustness test. We specify that interest rates may impact public social spending and use the same variable ordering as in the previous robustness estimation (because we assume that interest rates may not be independent of commodity ToT). Due to limited data availability, we are unable to estimate results for Argentina and Ecuador, and we have to use the lending rate as indicator for the interest rate for the remaining countries (except Brazil, for which we use the money market rate). Results (reported in appendix C.4) are very similar to our baseline results: controlling for the potential effect of the interest rate, the magnitudes and duration of the responses to commodity ToT shocks remain substantially unaltered. In exceptional cases, existing tendencies become statistically significant: an initial drop in health in Bolivia and an initial increase in education in Brazil (in per-capita spending). Furthermore, we observe an initial drop on percentage spending on health in Chile.

4.3. Discussion

As evidenced in Table 2, our findings offer a vital illustration of the heterogeneous impact of commodity ToT increases on public social spending across different Latin American countries. Among the commodity boom countries, we find very diverse responses of the various functions of public social spending to commodity ToT shocks. Responses range from no statistically significant responses in Bolivia and Colombia over temporary and longer-lasting increases of social spending to declines. The analysis reveals significant variations in the occurrence, magnitude, and longevity of reactions, as well as differences in how these reactions vary across functions of public social spending.

We observe an immediate and lasting increase in public social spending across all three functions in only two countries: Argentina and Ecuador. Other countries experience raises in some functions and mostly of shorter duration: Mexico in health and social protection, but not education, and Brazil in education and health spending per capita. The case of Chile is special: after an initial decline in expenses for all functions, per-capita spending turns positive for education and health after a few years. Peru also experiences an initial drop with recovery in percentage spending on social protection.

Only in the cases of Brazil and Chile, we find that social spending increases significantly in per-capita terms, but not as percentage of GDP. Here, apparently, economic growth and public social spending grow proportionately, thus leaving the share of GDP devoted to public social spending unchanged. In the remaining cases, statistically significant responses of public social spending to commodity ToT occur both in per-capita terms and as percentage of GDP. This implies that the increase in public social spending is stronger than GDP growth, hence public social spending grew over-proportionately.

We cannot find any general tendencies concerning the functions of public social spending that benefit more or less from ToT shocks. Sometimes responses vary across functions with respect to the time lag until a response occurs (Ecuador, Mexico, Chile), to the magnitude of the response (Ecuador) or to the occurrence of a response at all (Brazil, Chile, Mexico, Peru). There is no clear tendency that one function of social spending might especially benefit from commodity ToT increases in comparison to the other categories. Rather, variations in the responses seem to be country-specific. Variation of responses is larger between countries than between the different functions of social spending. Overall, we conclude that the theoretically different responses of health, education and social protection spending to the business cycle are not reflected in our data.

Based on our results, it seems difficult to argue that the commodity price boom was a main driver behind the increase in public social

Table 2
Results summary.

Country	Education	Health	Social protection
Argentina	Increase over about 5 years, partial decline thereafter		
Bolivia	no statistically significant response		
Brazil	Small and short increase per capita, then back to previous levels; no response in % spending		no stat. significant response
Chile	Initial drop followed by recovery; long-term increase in per-capita		Initial decline then recovery
Colombia	no statistically significant response		
Ecuador	Increase over about 5 years, partial decline thereafter		Quick upswing, slow decline
Mexico	no stat. significant response	Increase with peak around year 2	Increase with peak in year 5
Peru	no statistically significant response		initial decline, then recovery (% spending)

If not explicitly mentioned otherwise, summaries refer to both per-capita and percentage of GDP spending.

Table 3
Potential factors explaining the heterogeneity of our results.

Country	Left-wing government	Expenditure rule in place	Budget balance rule in place	GDP per capita	ECI
Argentina	2003–2015	2000–2009, 2018–2019	2000–2009	7666	0.14
Bolivia	2006–2019	–	–	977	−0.4
Brazil	2003–2016	2000–2019	1998–2019	3726	0.85
Chile	2000–2009, 2014–2017	–	2001–2019	5097	−0.01
Colombia	–	2000–2019	2011–2019	2527	0.12
Ecuador	2003–2016	2010–2019	2003–2009	1451	−1.02
Mexico	–	2014–2019	2006–2019	7232	0.9
Peru	2011–2015	2000–2019	2000–2019	1941	−0.39

Own table. Data: Left-wing governments: Feierherd et al. (2023, p.6); Fiscal rules: Budina, Kinda, Schaechter, and Weber (2012); GDP per capita (current USD, 2000): World Bank; ECI: Economic Complexity Index (2000): Harvard Dataverse (2019).

spending in Latin America, not even among the countries that experienced considerable commodity ToT gains during the boom. This does not mean, of course, that the price boom could not have been an enabling factor that led to social policy expansion in conjunction with other crucial factors, or under certain conditions. Several of such factors have been proposed in the literature (see Section 2). In the following, we briefly explore if these factors could help to sort our heterogeneous results.

4.3.1. Potential explanation 1: Left-wing and right-wing governments

In the discussion about Latin America's social policy expansion, a prominent explanation put forward has been the "pink tide" argument. The past decades witnessed the rise of left-wing governments in the region, and many observers propose that these are more prone to implement redistributive social policies as compared to rather right-wing governments (e.g. Birdsall et al., 2012; Cornia, 2010; Huber & Stephens, 2012). Feierherd et al. (2023) conduct a study examining the impact of left-wing governments on inequality reduction through the implementation of redistributive social policies, and identify an unconditional effect. Using a difference-in-differences approach while accounting for increased fiscal space from the commodity boom and other factors, they find that left-wing governments were able to decrease inequality relative to other governments – but over the whole region and not only in commodity boom countries. One might expect that increases in commodity prices are more likely to transmit into higher public social spending when the incumbent government is from the political left. We use the classification from Feierherd et al. (2023) to examine if our heterogeneous results could result from the governments' partisanship. Column 2 in Table 3 reports the years of left-wing governance in the commodity boom countries of our sample.

At the beginning of our observation period in 1990, none of the analysed countries had a left-wing government. During the commodity price boom phase, four countries elected left-wing governments (Argentina, Bolivia, Brazil, Ecuador). Peru had a left-wing government only during the last four years of the commodity price boom, while Chile had it at the beginning of the boom and again after the end of it. Mexico and Colombia had no left-wing governments during the observation period. Coming back to our findings, we observe that lasting rises in public social spending occurred indeed in left-wing governed Argentina and Ecuador as well as temporary increases in the left-governed Brazil. In Bolivia and the briefly left-governed Peru, however, there have been no effects of commodity ToT on public social spending during left-wing governments, and Mexico experienced social policy expansion in response to increases in commodity ToT without a left-wing government.

To test the pink tide argument further, we add a dummy for left-wing governments as well as an interaction term with the commodity ToT index to our SVAR model for those countries that were governed by a left-wing government at some point during our period of study. The IRFs, which we report in appendix C.5, refer to the interaction term and can be interpreted as the difference in response to a commodity ToT shock during a left-wing government in comparison with a non-left-wing government. In most cases, we do not observe statistically significant differences. Chile is the only case where we find that nearly all functions of public social spending (except health per capita) reacted significantly more positively to a commodity ToT increase under left-wing governments. For Bolivia, we find an initially negative effect on health related to the presence of left-wing governments. Unfortunately, we could not derive any results for Peru due to the shorter time series and the short period of left-wing governance.

In conclusion, a left-wing government seems neither a necessary nor a sufficient condition for a positive relation between commodity ToT and social spending among our set of countries that experienced a commodity price boom. This does not mean that left-wing governments played no role at all: they may have contributed to social policy expansion regardless of commodity boom effects, or may have even played a crucial role in one case (Chile). But we conjecture that it is too simple to expect that left-wing governments allocate additional resources from commodity booms towards public social spending in consistent manners and more than other governments. One may object that the classification of governments into left and non-left is too crude. For example, Arza et al. (2022) argue that it matters whether leftist governments are populist or not. Future research should pursue these avenues further.

4.3.2. Potential explanation 2: Fiscal rules

Fiscal rules are a common instrument to avoid overspending during boom phases of a business or commodity cycle. While developing countries, including Latin America, have for long exhibited procyclical government spending, there has been a move towards countercyclical fiscal policy over the past 20 years. A majority of Latin American countries designed institutions and employed fiscal rules to reduce procyclicality (Céspedes & Velasco, 2014). Fiscal rules have important implications for public social spending because they are designed to constrain governments' room for manoeuvre in both boom and bust times.

Data from the IMF Fiscal Rules Dataset (see column 3 and 4 in Table 3) shows that all countries of our sample, except Bolivia, had fiscal rules during the observation period (for varying time spans). The fiscal rules include expenditure rules and balanced-budget rules (BBR) (Heresi & Villacreces Villacis, 2023). Their designs differ across countries. Expenditure rules mainly comprise limits to government expenditure growth in relation to GDP (Argentina, Mexico) and to permanent revenues (Brazil, Ecuador). The Argentinian and Chilean BBR go in a similar direction, by linking expenditure to revenues. In Chile, the margin of government expenditure depends partly on the long-term copper and molybdenum prices, which is a direct reference to resource revenues. In Ecuador, the BBR limits government expenditure growth to a maximum of 3.5 percent independent of GDP or revenue development, while in Colombia and Peru it is linked to GDP growth. The Colombian BBR allows for higher expenditure when GDP lays at least two percentage points below the long-term growth trajectory, thus providing the possibility for countercyclical spending. In Brazil, the BBR refers to the "golden rule" that the government is only allowed to take credit for investments but not for current expenditure.

All of these rules limit the possibilities to increase government spending more than GDP growth or revenue growth. In some cases (Brazil, Argentina, Ecuador, and Peru), rules apply for current expenditures (like social spending), while capital spending is excepted. This limits the possibilities of governments to increase social spending during commodity price uptakes. Even in the Chilean case, where the cap is linked to resource prices, the reference to long-term prices prevents that short-term uptakes of these prices lead to larger financial leeway. Additionally, some rules require that permanent expenditure can only be financed by permanent revenues. The volatile revenues during commodity windfalls cannot account as permanent and therefore do not classify as a funding source for longer lasting social spending.

As nearly all countries of the sample applied fiscal rules at least during a large part of the commodity price boom, it could be that these rules reduced to some extent the response of social spending to commodity price increases. Overall, the existence of these rules cannot explain the heterogeneous reactions of social spending across countries – specially since Bolivia, a country without any responses, is the only country without fiscal rules and should thus have had more opportunities to increase public social spending as a reaction to commodity price increases (Banegas Rivero & Vergara González, 2019).

4.3.3. Potential explanation 3: Natural resource funds

Natural resource funds usually pursue the aim of reducing spending volatility and of contributing to the diversification of the economy away from resource dependence in commodity-abundant countries (Mami, 2023). These funds can take different forms. While sovereign wealth funds with the aim of inter-generational saving are commonly used in rich economies such as Norway, stability funds with a focus on flattening government expenditure over a shorter time horizon might provide better opportunities in capital-constrained developing countries (van der Ploeg & Venables, 2018). This particular form of natural resource fund is used to allocate commodity revenues towards a predetermined purpose, thus limiting the governments' discretionary power over revenue utilization (Fotak, Gao, & Megginson, 2013). Mostly, natural resource funds aim to strengthen economic, rather than social development. In other words, their resources are rarely used for social spending (Bauer, Rietveld, & Toledano, 2014). Hence we would expect that the existence of a natural resource fund limits the government's possibilities to increase social spending after a positive commodity price shock.

At the end of the commodity price boom, natural resource funds existed in Chile, Colombia (not yet in operation), and Mexico (Bauer et al., 2014). The Chilean natural resource funds are considered among the most successful examples of such an instrument (Schmidt-Hebbel, 2012).[10] It is plausible that their existence may have contributed to the temporary decline of public social spending as share of GDP in Chile: when commodity prices push GDP upwards but the revenues from their exports cannot be used for social spending due to the funds, a relative decline is a plausible effect.[11] In Mexico, public social spending did increase in reaction to commodity ToT increases despite the existence of a sovereign wealth fund, while the lack of social policy expansion in Colombia can hardly be attributed to a fund that was not yet operational during the strongest commodity price upswings. Overall, the presence of a natural resource fund is a plausible explanation of the observed patterns in one country of our sample.

4.3.4. Potential explanation 4: Degree of commodity dependence versus diversification

In commodity-dependent countries, where commodities account for a relatively high share of national economic activity, an increase in commodity prices should have a stronger effect on fiscal revenues as compared to countries where commodity exports play a minor role. Hence, the diversity of our results may be related to the varying degrees of commodity dependence across Latin American countries. Theoretically, commodity-dependent countries could have experienced larger effects on their fiscal space and hence on public social spending, while effects were minor in more diversified economies.

The degree of commodity dependence varied considerably across commodity price boom countries (see table A.1). Three groups can be distinguished: Venezuela and Ecuador are highly commodity-dependent with commodities accounting for more than 80% of total exports; a second group registers shares of commodities in total exports between 65 and 75 percent (Argentina, Bolivia, Chile, Colombia, Peru); and a third group, Brazil and Mexico, shows shares of 54 and 22 percent, respectively. The latter countries are classified as non-commodity dependent according to United Nations Conference on Trade and Development (2021).

Comparing the IRFs of these three groups, we observe no apparent relationship between response patterns of public social spending to commodity ToT and degree of commodity dependence. Long-lasting effects of commodity ToT increases on public social spending

[10] For a description of the functioning of the Chilean copper funds see Solimano and Calderón Guajardo (2018).

[11] It should be noted though that the natural resource funds cannot explain the drop in per-capita spending that we observe in Chile.

are found in Ecuador, Argentina and Mexico, which are representatives of each of the three groups and include the most and least commodity-dependent countries. Likewise, temporary increases are found in non-commodity dependent Brazil, whereas no effects can be detected in highly commodity-dependent Colombia, Bolivia, and Peru. Consequently, within the group of countries that experienced a commodity price boom, the degree of commodity dependence does not seem to provide an explanation for the pattern of our findings.

Another potential explanation could turn this idea around and depart from an economy's degree of diversification instead. Theoretically, it might be easier for richer and more diversified economies to use windfall gains from commodity booms to get increases of public social spending going, especially with longer-lasting increases in mind. This is because the relative economic importance of these windfall gains is minor here in comparison with smaller, commodity-dependent economies. Whereas smaller and commodity-dependent economies must be careful not to increase public social spending without securing funding for the longer term, more diversified economies might find it easier to use temporary increases in revenues to bring public social spending to higher levels with the aim of securing funding from other sources in the medium term.

To assess this potential explanation, we measure diversification using the Economic Complexity Index (ECI), shown in column 6 of Table 3. A higher value indicates that the country exports a larger variety of rather complex products. Furthermore, we consider a country's GDP per capita (column 5 of the same table). The most diversified and income-richest economies among our boom countries are Argentina, Mexico and Brazil. Chile is income-rich but rather commodity-dependent and not as diversified. Indeed, Argentina, Brazil and Mexico were among the countries where we observed positive responses of public social spending to commodity ToT increases – although partly only short-term and with exceptions. The case of Argentina appears to be particularly relevant, since long-lasting increases in all functions of public social spending were achieved. All in all, among the potential explanations that we considered, the idea that richer economies have a larger scope to use commodity windfalls for social policy expansion seems to apply to the largest number of individual countries.

5. Conclusion

This paper examined the responses of different types of public social spending (health, education, and social protection) to changes in commodity terms-of-trade in Latin America from 1990 to 2019. The commodity price boom from 2003 to 2013 fell into this period, to which many scholars attribute the simultaneous rise in public social spending in the region. Our results, however, show that rising commodity ToT led to rather heterogeneous responses across Latin American commodity exporters. Some countries experienced increases that lasted several years (Argentina, Ecuador), others observed temporary increases of few years (Brazil, Mexico), others reacted first with declines and then rises (Chile), and yet others did not respond at all (Bolivia, Colombia, Peru). Different functions of public social spending were affected to different degrees in different countries, without any clear patterns. As expected, we could not relate public social spending with commodity prices in countries without commodity price boom.

Our results suggest that there is substantial between-country heterogeneity in the relationship of commodity prices and public social spending, and no universal impacts of the former on the latter. In other words, the commodity boom was neither necessary nor sufficient for the rise of public social spending in Latin America. Among countries that have seemingly used increased revenues from commodity price booms for public social spending, there is no clear tendency concerning the function of spending that benefits most. Overall, the variance in the response of public social spending across countries seems to be larger than the variance between the different functions of social spending. Whilst not the topic of this paper, we note that the observed increases in public social spending alone do not say much about the quality of social policy, as public spending on health, education or social protection can be implemented in various ways and benefit target populations more or less successfully (see e.g. Birdsall, Lustig, & Meyer, 2014).

We conjecture that the purported significance of the commodity price boom as enabling factor for augmenting public social spending in Latin America generally may be overrated, as it neither proved indispensable nor sufficient for fostering social policy expansion. Nonetheless, it remains plausible that public social spending was influenced by commodity prices in certain countries, prompting us to assert the need for in-depth examination of country-specific factors and processes that determined the circumstances in which expanded policy space is allocated to public social spending. We considered several potential explanations and discussed if they could be used to sort our heterogeneous findings. First, the presence of left-wing governments – a frequent explanation of Latin American social policy expansion in the literature – is certainly no plausible explanation for all our country cases, but could potentially have played a role in the case of Chile. Second, different institutional settings that govern the use of commodity windfall gains could theoretically explain varied responses to the commodity boom, but do not seem to play a particular role in any of the countries we studied. Third, natural resource funds also limit the discretionary use of such windfall gains considerably. Such funds are in place in only three Latin American countries, and only the one in Chile may help explain the short-term declines of social spending observed there. Fourth, richer and more diversified economies – in our sample, Argentina, Brazil, Chile and Mexico – could have found it easier to use windfall gains from commodity booms to bring on social policy expansion. Ecuador could be regarded as an exceptional case that expanded public social spending despite being commodity-dependent, while the other less rich and equally dependent countries did not. Future research could explore these lines of interpretation further.

This study is limited by the availability of appropriate time series data. As discussed in detail, we only had access to public social spending information at the level of the central government for most countries. In reality, additional revenues from the commodity boom may have benefited public revenues and public spending at sub-national levels, for which no time-series data are available. This is a potential source of bias of our results and hence a limitation not only for our analysis but also for policy advice, and highlights the urgent need for better data. Future research will hopefully be able to replicate our analysis using richer data sources. In the meantime, this shortcoming may be adequately addressed in country case studies, too.

CRediT authorship contribution statement

Svenja Flechtner: Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Data curation, Conceptualization. **Martin Middelanis:** Writing – review & editing, Writing – original draft, Software, Methodology, Investigation, Formal analysis, Conceptualization.

Declaration of competing interest

Both authors declare that they have no competing interests to declare.

Data availability

The replication package is available in the github repository https://github.com/svenjafl/socialspending_replication.

Acknowledgements

We are grateful for valuable comments and suggestions by Winnie Coleman, Barbara Fritz, Janeth Alejandra García Herrera, Heike Joebges, Carmen Marull Maita, two anonymous reviewers and the editor. We benefitted from earlier collaborations and discussions with Diego Sánchez-Ancochea and acknowledge guidance on ECLAC data by Rodrigo Martínez. We also thank participants of the Forum for Macroeconomics and Macroeconomic Policies (FMM) Conference 2023 and of seminars at Freie Universität Berlin and the University of Siegen. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.worlddev.2024.106717.

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Erklärung gem. § 4 Abs. 2
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Ort, Datum: Berlin, 21.10.2024
Unterschrift: