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Global trade in plastics: insights from the first life-cycle trade database

Abstract

This paper presents the first attempt to quantify and map global trade flows across the entire life cycle of plastics – from raw inputs to final plastic products as well as waste. It draws on a new prototype database created by UNCTAD and the Graduate Institute, which draws on a granular examination of official trade classifications and compiles data on a far broader set of plastics-related inputs and products than those commonly used. This paper finds that trade is immense, with exports of primary, intermediate and final forms of plastics summing up to more than US\$1 trillion in 2018 or 5% of the total value of global trade – almost 40% higher than previous estimates. This paper also finds that plastics trade is multifaceted and complex. While some key countries dominate trade across the plastics value chain, a wide diversity of countries are active as both importers of plastic products and exporters, using plastic as a means to participate in global value chains and to add value to exports.

At the same time, while this original database captures a range of neglected trade flows across the plastics life cycle, it is a prototype and still provides an incomplete picture, in part due to the methodological challenges of quantifying the value and volume of plastics 'hidden' in millions of products traded internationally (e.g., plastics embedded in products or used in pre-packaged products). The paper makes an original contribution to understanding of the dynamics of the global plastics economy, through the lens of trade. The findings can help governments and stakeholders to reduce plastics pollution and CO_2 emissions through more effective use of trade policy in addition to other policy levers.

Key words: Plastic, Trade, Development, Green Economy.

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The analysis presented in this paper draws on a prototype database that is a work in progress and will be released online as a free and open resource by UNCTAD later in 2021. This paper aims to stimulate debate that will help to refine the database and contribute to wider efforts to reduce plastics pollution.

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Introduction

This paper presents the first attempt to quantify and map global trade flows across the life-cycle of plastics – from raw inputs and subsequent plastic products to its final stage as waste. It draws on a new original prototype database currently under development by UNCTAD and the Graduate Institute. Derived from granular examination of official trade classifications and UN Comtrade statistics to identify the breadth of plastics-related inputs and products traded internationally, this new database reveals trade flows commonly neglected in efforts to capture the scale of plastics trade.¹ By drawing attention to the trade flows partly or completely hidden in conventional estimates of plastics trade, this original approach enables a better estimation of the extraordinary scale, breath and complexity of trade flows across the life-cycle of plastics.

The first finding from this new approach is that the scale of global trade in plastics is immense, with exports of primary, intermediate and final forms of plastics summing to more than US\$1 trillion in just one year alone – around 5% of total global trade in 2018.² This figure is almost double previous estimates that did not capture the entire plastic life-cycle nor the breadth of plastics products traded internationally (WTO 2020). Even then, this higher valuation still significantly under-estimates the total value of plastics traded internationally due to the challenges of estimating the value and volume of 'hidden' plastics embedded in millions of products traded internationally or used in associated packaging.

Second, the data shows that international trade occurs at every step of the plastics life-cycle – from feedstocks, to primary plastics in resin pellet and fibre forms, through to intermediate plastic goods, final manufactured plastic goods and plastic waste. Trade is also broad in terms of geographic spread – virtually all countries are importers of plastic in one form or another, and many are exporters as well. This trade is multifaceted and complex, with different countries being involved in different points of the life-cycle depending on their endowments of plastics feedstocks (fossil fuels) or infrastructure (refining capacities; position in global manufacturing chains), or the nature of their economies (agricultural or industrial). Developing countries are involved alongside advanced ones; for some, plastics trade has been part of a wider strategy of economic diversification. For example, plastic packaging has been central to efforts of some countries to add value to their agricultural exports. At the same time, some of the countries most heavily impacted by plastic pollution contribute least to plastic production, consumption and trade, especially Small Island Developing States (SIDs).

Third, the data shows that trade is significant across the life-cycle of plastics. For some plastics – such as synthetic textiles and rubber tyres, as much as 60% of the total volume of global production is traded internationally. For other categories of plastics, trade is less significant, with a larger share produced and consumed domestically. However, even where the total volumes of trade as a proportion of production are not significant, their environmental impacts can still be important. For countries that lack capacity to manage plastic waste, import of single use plastic products, empty plastic packaging and pre-packaged imported products can significantly exacerbate their existing environmental burden.

The analysis in this paper aims to contribute to a better understanding of the plastics industry and plastics lifecycle, through the lens of trade, and to inform analysis of the range of policy levers and tools that could potentially help reduce plastics pollution. Recent efforts to regulate environmentally unsustainable trade in plastic waste have already highlighted the trade policy has a vital role to play as part of the solution to plastic pollution (Khan 2019). Our findings widen the focus beyond waste; they suggest that a logical next step will be

¹ The UNCTAD ComTrade database is accessible at https://comtrade.un.org. The UNCTAD dataset on plastics will be published online in early 2021; it will be free and open to all (as all UNCTADstat is published under CC IGO 3.0) with the goal of providing a high value global public good.

² The WTO estimated that world merchandise exports totalled US\$19.48 trillion in 2018 (WTO 2019).

to explore the potential role of trade policy to support efforts to reduce plastics pollution across the life cycle and to transform national and global production systems toward greater environmental sustainability (Deere Birkbeck & Sugathan 2021). This is important because, in addition to widely publicized challenges of marine plastic pollution, the plastics sector contributes significantly to greenhouse gas emissions and to an array of environmental and health challenges on land and in the air across the life cycle of plastics (Pew and Systemiq 2020), many of which disproportionately impact economically disadvantaged communities (Azoulay et al, 2019). On the international policy front, our analysis of trade flows across the life-cycle of plastics can also support and inform emerging policy dialogue on the relevance of international trade policy to plastics pollution at the WTO (Deere Birkbeck 2020; WTO 2020b) and in the context of calls for a new UN treaty on plastics pollution (Raubenheimer & Urho 2020).

Background to the development of the prototype database

This prototype database emerged from, and is nested within, broader efforts by UNCTAD, the Graduate Institute and others to address the gap in attention to the global political economy of the plastics sector, including the economics and politics of international trade in plastics. Together, a project on Transforming the Global Plastics Economy was launched in early 2019 with the support of the Swiss Network of International Studies (SNIS) (see www.plasticpolitics.solutions). To date, most literature and public attention to plastics pollution has focused 'downstream' on plastic waste – arising mostly from concerns about pollution of waterways and the ocean – including international trade flows in plastic waste (Brook et al 2018; Lavendar Law et al 2020).

However, there has been surprisingly little attention to the production or 'upstream' side of the plastic life cycle, i.e., plastics production and consumption before it becomes waste. In the policy arena, interest in a more circular economy for plastics is shedding some light on the links between upstream production and downstream pollution, but the upstream dynamics of the plastics and petrochemical sectors and their relevance to plastic pollution across the life cycle are only just starting to attract the scholarly analysis it deserves (Nielsen et al 2019). Similarly, although this study of trade flows underscores that the plastics economy is global, there has been surprisingly little systematic academic focus on the global political economy of the global plastics sector – underpinned by international trade and investment – and how this impacts efforts to reduce plastics pollution (Barrowclough & Deere Birkbeck 2020).

Moreover, beyond looking at trade in plastic waste, there has been no systematic scholarly attention to other international trade flows across the life cycle of plastics and the relevance of trade and trade policy to efforts to curb plastic pollution. And yet, a significant portion of key plastic products is traded internationally. Tens of millions of tonnes of plastic packaging are associated with thousands of pre-packaged products traded internationally each year, from electronic goods to bottled water and chocolate bars, and millions of additional tonnes are associated with the international transportation and distribution of products. Plastic is also embodied in countless products traded and consumed across the world – from cars to household appliances, toys, construction equipment, rubber tyres, and paints. Further, one of the most valuable components of plastics trade is in fact plastic its rawest forms – resin pellets and fibres – which are then transformed into a vast array of intermediate and final plastic products within importing countries. Improved understanding of all of these trends in trade will help policymakers to identify strategic entry points for regulations or other measures to reduce excessive use of plastics and plastic pollution.

Plastic trade flows are relevant to plastic pollution for three reasons: 1) trade in plastics products, products containing plastics, and products packaged in plastic adds to the waste management burden that importing countries face and is a conveyer belt for the spread of products responsible for microplastics pollution; 2) trade flows in plastic waste to countries with inadequate waste management capacity can exacerbate leakage of plastics into the environment, and 3) the plastics sector and the fossil fuel and chemical inputs from which

it stems contribute significantly to greenhouse gas emissions and environmental and health challenges. Indeed, the plastics issue can be seen as a concrete, sectoral example of how a more sustainable global economy requires structural transformation – an agenda sometimes described as a Green New Deal (UNCTAD 2019).

Shifting the plastics sector toward greater environmental sustainability, including a lower contribution to greenhouse gas emissions, will require a judicious blend of government and industry policies to ensure that weaning the world off excessive use of plastic occurs through a transition process that is just – which in turn is vital to ensuring the transformation is sustained. The information that our prototype database draws together will support this process of transformation and just transition by enabling policymakers and experts to identify key trends, significant actors and pivot points across the life-cycle of plastics where policy levers and support mechanisms are needed, and could potentially be applied.

Structure of the paper

Section 1 sets out the basic issues at stake. It briefly introduces the key phases of the plastics life cycle, focusing upstream on the production end of the cycle and the trade flows to be explored. Section 2 introduces the prototype database and data sources for trade flows at different stages of the plastics value chain, highlighting the new insights revealed. Section 3 introduces the main findings, Section 4 shows findings by industry sectors and Section 5 shows bilateral trade trends and discusses their implications for plastics production and trade. Section 6 concludes with ideas for further research.

1. Plastics pollution and trade: issues at stake

Plastic pollution has fueled the environmental debate since the 1950s. It is only in the last decade, however, that scholarly interest in plastic pollution really start to grow, as reflected by growing numbers of papers and reports into this area. Most of this literature has focused on understanding and measuring the leakage of plastic materials into the oceans and its environmental impacts. Recent papers have focused, for instance, on the public health implications of plastics pollution that disrupts ecosystems and contaminates food chains.

In general, the existing scholarly and policy literature has been oriented toward the downstream side of plastic pollution, leaving largely unexplored the source of pollution in the first place and the potential for policies to curb pollution by focusing attention 'upstream' on production and consumption. In this paper, we aim to contribute to growing efforts to bridge the gap by analyzing trade relations across the global plastics industry and the life cycle of plastics.³

Plastics as an industry – the plastics life-cycle

The plastic life cycle begins when oil and gas are extracted and then refined, usually by petrochemical companies. Fossil fuel feedstocks for plastic production are outputs of the oil and gas refining process and are the key inputs for virgin plastic polymers. These polymers are usually produced in the form of resin pellets or fibres and there are about 30 main different types of primary plastic polymers in this first stage of the plastics life cycle. These primary forms of plastics are purchased by producers and suppliers of plastics materials, both nationally and on the international market. The buyers convert the pellets and fibres into value-added plastics products (intermediate or final) that are also tradable internationally.

The list of plastic products traded internationally is enormous, including plastic packaging; synthetic textiles and finished clothes; construction materials and industrial machinery; electrical and electronic goods; beauty and household consumer products; paints, coatings and markings; automobile parts. These are produced and used in myriad ways, including by vertically and horizontally integrated companies with subsidiaries and partners across the world as well as by small and medium enterprises. Plastic packaging, for instance, is both produced and shipped across the world; either traded 'empty', as a product in its own right, to be combined with the products in the purchasing country, or as wrapping of underlying products and as part of packaging used in distribution.⁴ The final stage in the plastics life cycle examined in this paper is plastic waste. In the past several years, there has been growing recognition that trade in plastic waste from developed to developing countries has greatly exacerbated problems of marine plastic pollution (GRID-Arendal 2019; Jambeck 2017).

³ For two recent reviews of the global political economy of the plastics industry, see Barrowclough and Deere Birkbeck (2020), and CIEL (2017).

⁴ See for example UN Environment (2018b), Jambeck and Low (2017), and Barrowclough and Deere Birkbeck (2020) among others.

Although purportedly shipped for management through landfill, incineration or recycling, the evidence reveals that most waste shipped to developing countries has been openly discarded on land or leaks into river systems and the sea (UNEP 2018a, b). This reality has spurred a number of countries to restrict or ban imports of certain plastic wastes as well as international agreement on a set of 'plastic amendments' to the Basel Convention on the Transboundary Movement of Hazardous Wastes that aim to better regulate trade in plastic waste (BRS, 2019).

The lifecycle of plastics thus engages a broad set of commercial stakeholders – starting with the fossil fuel feedstocks sold by major global companies (fossil fuel and petrochemical); moving through major global value chains in the construction, clothing and foods industries; to transporters at all points across the value chain; to small domestic enterprises and eventually to waste management companies, plastics waste traders and informal workers in the waste-sorting and scrap industries. In some cases, the cycle starts up again with new products generated from waste that is re-cycled, downcycled or up-cycled or used in waste-to-energy applications.

In contrast to most of the literature, which has focused attention on trade in plastic waste, this paper highlights the fact that international trade plays a central role in global supply chains across the whole plastic life cycle (see Box 1).

Box 1. International trade in plastics – points of trade entry in the plastics life-cycle

Trade flows are key to global markets & supply chains for:

- fossil fuel feedstocks and chemical precursors for plastics
- additives used in plastics
- primary plastics (resin pellets and fibres)
- multiple plastic end-products (including synthetic textiles and plastic packaging)
- products with a high share of embedded plastic
- products wrapped in plastic
- plastic waste,
- recycled plastic
- secondary waste products.

2. Creation of the Plastics Life-Cycle Trade

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