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A Dirty Dilemma: Determinants of Electronic Waste Importation

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A DIRTY DILEMMA: DETERMINANTS OF ELECTRONIC WASTE IMPORTATION

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ABSTRACT

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During the 1970s-1980s waste, specifically toxic waste from manufacturing, became a globally traded commodity. By the late 1980s, waste trade became a global political and environmental topic because many believed that developed countries were 'dumping' hazardous material on less developed nations despite knowing that less developed countries often lack adequate infrastructure to dispose of waste in an environmentally responsible manner, prompting international regulatory responses.

This study focuses on the fastest growing category of traded toxic waste – electronic waste. In 2014, approximately 41.8 million tons of electronic waste was generated globally.[1] During this same period 1.6 million tons were traded in the global economy. Electronic waste is particularly intriguing because of its mix of toxic dangers and high value opportunities. Unlike other hazardous waste, electronic waste is composed of toxic materials such as lead, mercury, cadmium and brominated retardants that can adversely affect human health and the environment and valuable recyclables such as iron, copper, gold, silver, and rare earth metals.

Scholars debate whether the domestic political structure, international environmental agreements or economic factor is the primary determinant that induce states to import hazardous waste. The aim of this study is to provide insight to this puzzling question.

The study creates a Waste Trade Framework that is a compilation of political, economic and environmental determinants. The framework is then tested using partial least squares-structural equation modeling. The study finds that when developed and developing countries

[1] C.P. Baldé, Wang, F., Kuehr, R., Huisman, J, "The Global E-Waste Monitor," (Bonn, Germany 2014).

are evaluated jointly, the economic factor has the largest impact on electronic waste import volume. When developed and developing countries are modeled independently, electronic waste import volume in both country types is most influenced by the political economic factor (the interaction of politics and the economy).

For my Daddy.

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CHAPTER 1

INTRODUCTION: A DIRTY DILEMMA

During the 1970s-1980s waste, specifically toxic waste, became a globally traded commodity. Manufacturing firms, primarily in developed nations, sought to discard hazardous by-product waste. Other nations accepted the waste as a method to increase state revenue. By the late 1980s, waste trade became a global political and environmental topic because many believed that developed countries were 'dumping' hazardous material on less developed nations despite knowing that less developed countries often lack adequate infrastructure to dispose of waste in an environmentally responsible manner. In 1989 the Basel Convention was established in response to the growing concern. The Convention aims to reduce the generation of hazardous waste and to protect the environment and human and animal heath from hazardous waste.[1] Notably, it does restrict waste trade but rather set guidelines for both the transboundary movement and disposal practices of hazardous waste. This in combination with the demand for waste disposal services led to the growth of the waste trade industry. As a result, hazardous waste became a global commodity, the buying and selling of a product or service in the capitalist market for profit.[2]

CHANGE IN HAZARDOUS WASTE

As globalization continues the types of hazardous waste changes. The digital revolution notably transitioned society from analogue technology to digital technology. Improvements in technology enable manufacturing firms to produce and distribute consumer goods globally at a

[1] Basel Convention, "Convention Overview," Accessed June, 2016, http://www.basel.int/TheConvention/Overview/tabid/1271/Default.aspx.

[2] Jan Aart Scholte, *Globalization: A Critical Introduction*, 2nd ed. (New York, NY: Palgrave Macmillan, 2005), 161.

lower cost. At the same time, the 'digital revolution' spurred the production of electronic consumer goods. Typewriters and adding machines have been replaced with personal laptops and tablets. Landline phones and film cameras have been replaced with cellular phones and Smartphones. Appliances have been updated with smart features. Smart Refrigerators allow you to see what is inside without opening the door. Stove-tops have Wi-Fi cook ability with virtual LED flames.[3] All these products have toxic components and are considered electronic waste once discarded.[4] Electronic waste is now considered the fastest growing waste stream[5] and is a significant portion of 21st century toxic waste.

In 2014, approximately 41.8 million tons of electronic waste was generated globally.[6] Interestingly, the widespread use of electronic goods is profound in both developed and developing countries. Consumers in developed countries have more disposable income to purchase electronic products. On average customers in developed nations replace larger electronic products every five years; smaller electronics such as smart phones are replaced more often.[7] Electronic waste in the European Union increases 3-5% annually, about three times faster than other municipal waste streams.[8] Rwanda produces between 10,000 and 15,000 tons of e-waste annually and expects an annual growth rate of 6%.[9] The Rwandan government states that the increase is attributed to economic development and to the nation's initiative to improve information and communication technologies that require the use of tools

[3] Wi-Fi (Wireless Fidelity) allows a user to connect an electronic device to an internet connection. LED (light emitting diode)

[4] Although a formal definition of e-waste has not been established, most agree that it consists of products that have an electronic plug or have electrical components. Rolf Widmer et al., "Global Perspectives on E-Waste," *Environmental Impact Assessment Review* 25, no. 5 (2005): 438-39.

[5] Ludgren (2012), Balde et al. (2014), Cucchiella et al. (2015), Wang et al. (2016).

[6] Baldé.

[7] Chris Ely, "The Life Expectancy of Electronics " Consumer Technology Association, https://www.cta.tech/News/Blog/Articles/2014/September/The-Life-Expectancy-of-Electronics.aspx.

[8] Tina Wakolbinger et al., "When and for Whom Would E-Waste Be a Treasure Trove? Insights from a Network Equilibrium Model of E-Waste Flows," *International Journal of Production Economics* 154 (2014): 263.

[9] Paul Ploumis, "Rwanda Announces Opening of Newly Built E-Waste Recycling Facility," Shanghai Metals Market https://news.metal.com/newscontent/100721639/rwanda-announces-opening-of-newly-built-e-waste-recycling-facility.

such as laptops and mobile phones. These changes have also facilitated the demand for newer products.[10]

Figure 1.1 illustrates the development of electronic waste generation and electronic waste trade. It is estimated that global e-waste production will be nearly 50 million tons in 2018.[11] The rapid and continual growth of e-waste has created a dirty dilemma in which nation-states, both developed and developing, generate more e-waste than they are either willing or able to dispose of domestically. Transforming e-waste into a global commodity, a good that can be bought and sold, in the international system may serve as solution to the dilemma.

ELECTRONIC WASTE AND ELECTRONIC WASTE TRADE

According to the United Nations Commodity Trade Database, electronic waste (e-waste) can include "electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles, waste and scrap of primary cells, primary batteries and electric accumulators; spent primary cells, spent primary batteries and spent electric accumulators; electrical parts of machinery or apparatus."[12] Circa 1997, e-waste trade experienced a sharp decline after the Basel Ban Amendment, prohibiting developed countries from sending toxic waste to developing countries was ratified in 1995. During the early 2000s e-waste trade was relatively flat. Around 2006, e-waste trade begins to gain momentum. Although, e-waste consists of more than

[10] Ministry of Trade and Industry, "National E-Waste Management Policy for Rwanda," ed. Ministry of Trade and Industry (Kigali, Rwanda 2015), 2.

[11] Baldé, 24.

[12] United Nations, "United Nations Comtrade Database," Accessed June 2016, https://comtrade.un.org/. Commodity HS 854810

personal computing devices it is worth mentioning that after the launch of the iPhone in 2007[13] e-waste trade has increased year over year (Figure 1.2).[14]

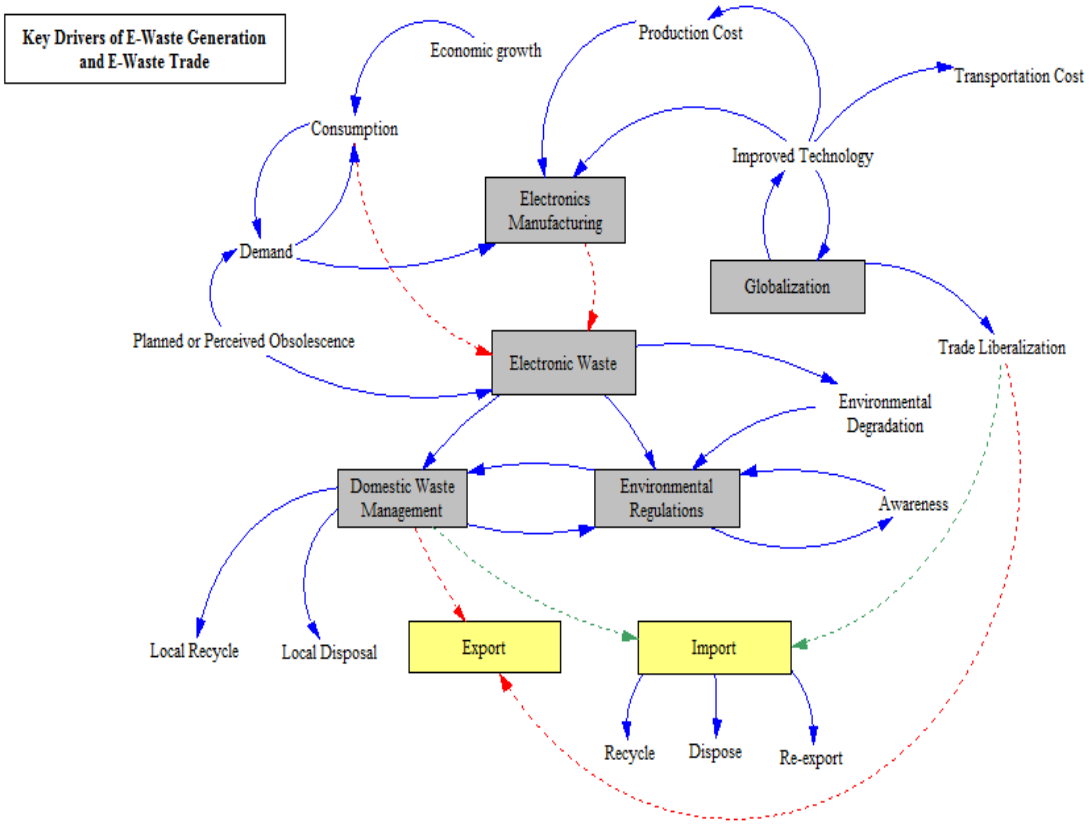

Fig. 1.1 Causal Loop Diagram of key drivers of electronic waste generation and trade

[13] Apple and the iPhone are credited with being the leader in the market and catapulting global consumer use of hand held devices. The initial launch of the iPhone sold over 100 million units in only 74 days in the United States. By 2008 it was available for sell in 21 countries. In 2010 there were 85 million IOS users. Time Magazine, "8 Years of the Iphone: An Interactive Timeline," Time Magazine http://time.com/2934526/apple-iphone-timeline/.

[14] United Nations. Commodity HS 854810 import volume data 1996-2014.

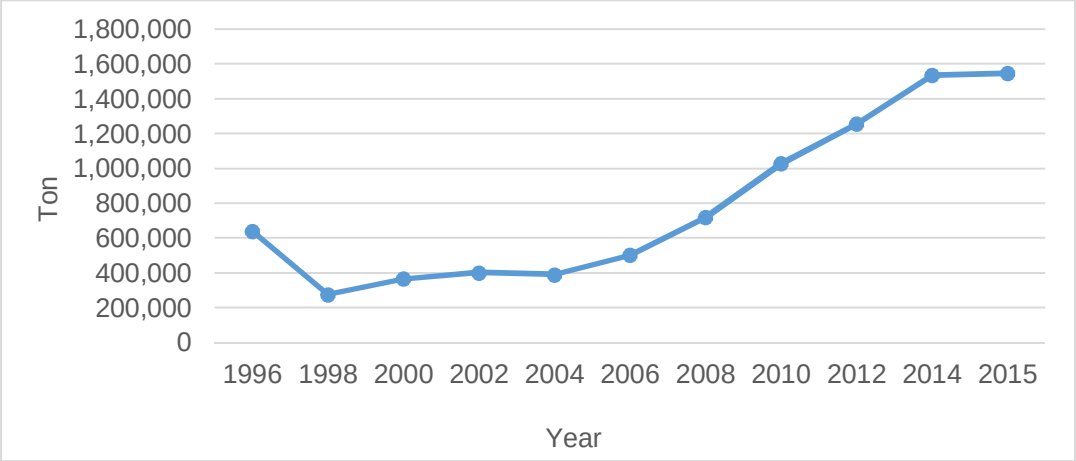

Fig. 1.2 Global Electronic Waste Import Volume

Beyond the growth of electronic waste trade, it is important and interesting in two ways. First, it operates paradoxically to international trade theories. The Heckscher-Ohlin-Samuelson (HOS) international trade theory posits that a country produces and exports goods in which it has a comparative advantage. It also assumes that importers buy a product and/or service from the exporters. Exporters gain revenue as importers not only pay the purchase price for the goods but also pay an importation tariff. However, electronic waste trade does not align with this behavior. First, some countries import waste despite not having a comparative advantage in waste management, processing and disposal. Additionally, in waste trade, exporters generally pay a fee to importers because the exporter is paying for 'disposal services'. Thus, importers of electronic waste are revenue earners.

The structural dichotomy of electronic waste is another interesting aspect of e-waste trade[18] and is also presumably a reason why e-waste trade does not follow traditional trade conventions. Like other hazardous material, electronic waste contains toxic components, lead, mercury, cadmium and brominated retardants, that can adversely affect human health and the

[18] Robinson (2009) provides an overview of the production, structure and environmental impacts of e-waste.

environment.[19] People are exposed to these toxins via the water stream, air pollution, soil contamination and by physically handling the product. Studies show that over exposure to these materials can lead to irreversible cognitive deficits and impair motor skills particularly in children.[20] At the same time, electronic waste is composed of iron, copper, gold, silver and other rare earth metals, [21] which makes it optimal for urban mining.[22] These metals, now considered technology metals, are essential to the production of electronic consumer devices and advanced weaponry systems.[23] Consequently, the value of these components play a role in electronic waste trade.

From 2006 to 2008 the value of e-waste rose 139% from $232 million (USD) to $556 (USD). In 2008 the Basel Convention formally acknowledged e-waste as a valuable commodity by shifting its perspective of viewing it as value less waste to a resource that provides economic benefits.[24] Achim Steiner, the Executive Director of the United Nations Environment Programme UNEP comments that,

> "Today, the protection of vulnerable countries remains as important as ever. At the same time, if the Convention is to retain its relevance in the 21st century it is necessary to identify a practical approach that provides protection to countries that need it, while at the same time supporting the realization of the economic incentives and benefits of environmentally sound recycling and resource recovery operations in those countries that are in a position to do so."[25]

[19] Balde et al. (2014)

[20] Chen et al. (2011), Luo et al. (2011).

[21] Michelle Heacock et al., "E-Waste and Harm to Vulnerable Populations: A Growing Global Problem," *Environmental Health Perspectives (Online)* 124, no. 5 (2016): 550.

[22] Urban mining in the context of this paper refers to the extraction and recovery of coveted metals from obsolete products for profitability purposes. Urban mining can also be considered a form of electronic waste recycling. Literature discussing urban mining include works by Balde et al. (2014), Krook and Bass (2013), Johansson et al. (2013), Brunner (2010).

[23] Technology Metals Research, "What Are Technology Metals?," Accessed May 7, 2017, http://www.techmetalsresearch.com/what-are-technology-metals/.

[24] Secretariat of the Basel Convention, "Our Sustainable Future: The Role of the Basel Convention," (Geneva, Switzerland: UNEP/SBC, International Environment House I, 2008), 3.

[25] Secretariat of the Basel Convention, "Basel Convention Bulletin," (Geneva, Switzerland: UNEP/SBC, International Environment House I, 2011), 3.

In 2010 revenue from global hazardous waste management services was $20.2 billion dollars USD (4 percent of all global environmental services revenue).[26] During this period, the value of electronic waste traded was $657 million.[27] By 2015, imported electronic waste was valued at approximately $1.2 billion USD, a 651% increase since 1996 (Figure 1. 3).[28] Consequently, electronic waste trade has evolved into a form of reverse logistics, where products are purposely imported for reuse, remanufacturing, recycling or disposal.[29]

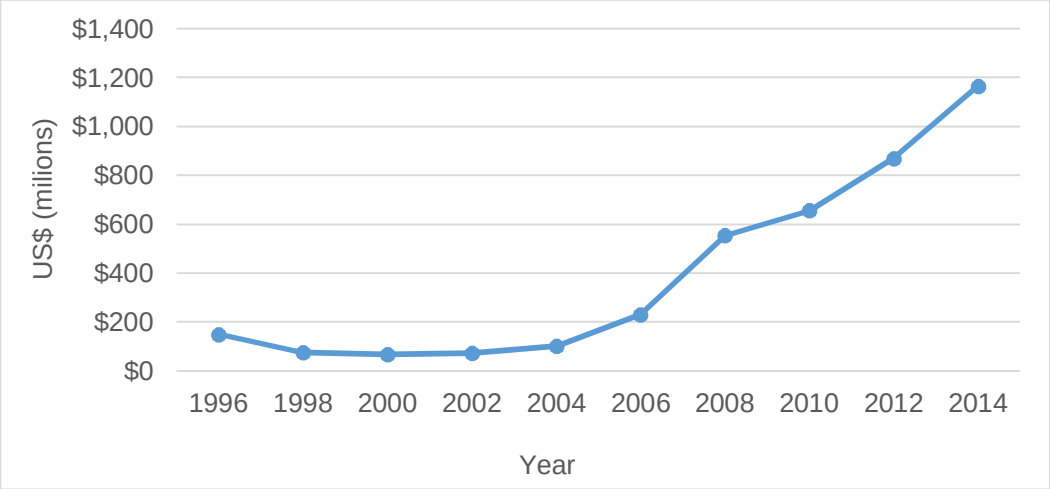

Fig. 1.3 Value of Global Imported Electronic Waste

Interestingly, after the Basel Convention shifted its view from waste to resource, the value/ton of electronic waste increased substantially in developed countries as compared to developing countries (Figure 1.4).

[26] United States International Trade Commission, "Environmental and Related Services," ed. United States International Trade Commission (Washington, DC 20436 2013), x. Environmental services include water and wastewater services, solid and hazardous waste services, and remediation services.

[27] United Nations. Commodity HS 854810 import value data 1996-2014.

[28] Ibid.

[29] Rahman and Subramanian (2012) discusses how factors within the causal loop diagram influence computer recycling operations.

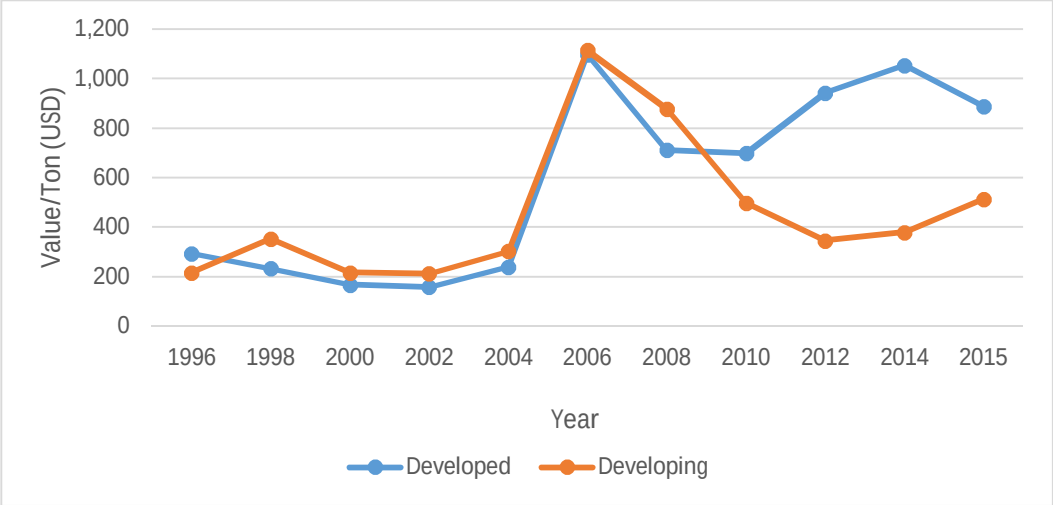

Fig. 1.4 Value/Ton of Global Imported Electronic Waste

It is important to note that like other traded goods, the market plays a critical role in the value of e-waste. To a degree, the value of electronic waste is influenced by those who control the market. E-waste trade can be described as a global oligopoly in which a few countries control and import most of the world's electronic waste most likely because they have a comparative advantage in extracting the metals. The top 15 importers are predominately developed countries and account for 89% of global import e-waste volume (Table 1A). Consequently, these nations can impact the value of e-waste and alter the supply of the extracted components. In turn, this affects the resale price of the metal and ultimately the cost of new electronic equipment. An example of this occurred around 2010 - 2011 when the cost of technology metals increased substantially. Although, the prices leveled off it reminded companies that they rely heavily on China which sources most of the material.[30]

Even without price/market manipulation, the value of e-waste can also be affected by the general supply and demand of the technology metals.

[30] Ian Hardy, "Could You Cope with Smartphone Rationing?," BBC News, http://www.bbc.com/news/business-40248405.

"The problem with the technology metals is that [the] supply of them, or more specifically [the] maximum rates of production of them, is critically dependent mostly upon our production of base metals. In the case of the rare-earth metals, mined as a group, the key supply issue is the complex metallurgy of the separation of the individual rare earths from each other."[31]

Nonetheless, importing electronic waste is beneficial in two significant ways, opportunity for revenue and job creation. States earn revenue not only from being paid by other nations to accept the commodity but they also reap financial benefits from the components that can be extracted, repurposed and resold. Also, job growth in waste management facilities has resulted from the massive and rapid growth of e-waste and the increase in global sustainable development and green economies initiatives. Recycling facilities in Brazil, China and the United States, [the world's top e-waste importers] employ roughly 12 million people.[32] Beyond this, "recycling is likely to grow steadily and form a vital component of greener waste management systems, which will provide decent employment."[33]

However, the repositioning of hazardous waste to a resource, the increasing value of e-waste, and its rapidly growing stream lead to two sub-debates. First, a controversial discourse on the flow of e-waste (who imports e-waste and from whom) and perhaps more interesting, the dispute over what constitutes a comparative advantage in importing waste.

WASTE TRADE PATTERN DEBATE

Academic interest in analyzing the phenomenon of waste trade leads to divergent theories. Proponents of the pollution haven hypothesis/north south divide theory posit that

[31] Technology Metals Research.

[32] United Nations Environment Programme, "Waste: Investing in Energy and Resource Efficiency " in *Towards a Green Economy Pathways to Sustainable Development and Poverty Eradication* (Nairobi, Kenya: UNEP, 2011), 292.

[33] Ibid.

asymmetries in the world distribution of income cause less developed countries to enact lax environmental laws in hopes of increasing national revenue. Therefore, the flow of waste is from developed countries (presumably with more stringent regulations) to less developed countries (inclined to have lax regulations).[34]

Along similar lines, the race to the bottom theory conjectures that some states' economic growth strategy is based primarily on specializing in 'dirty' industries.[35] Dirty industries are characterized as having high emissions and pollutants that are detrimental to the environment and harmful to human and animal life. Scholars argue that hazardous waste management should also be included in the spectrum of dirty industries because of its harmful environmental effects.[36]

Alternatively, scholars argue that the flow of waste is to developed nation-states. [37] These scholars posit that economically advanced nations have a comparative advantage in innovation and technology that leads them to efficiently and effectively properly dispose of waste while maintaining strict environmental regulations. Therefore, the flow of waste can be exported from both developed and developing countries to a developed nation.

Additional studies indicate that the flow of waste is not from rich to poor countries but flows from developed to developed countries. This is large in part due to multilateral trade and environmental agreements. Lastly, others surmise that e-waste is traded regionally.[38]

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[34] Literature on the pollution haven hypothesis indicating that the flow of waste is from rich to poor countries include Clapp (1994, 2001), French (2000), Kellenberg (2009, 2010), Lucier and Gareau (2015).

[35] Cristina A. Lucier and Brian J. Gareau, "From Waste to Resources? Interrogating 'Race to the Bottom' in the Global Environmental Governance of the Hazardous Waste Trade," *Journal of World-Systems Research* 21, no. 2 (2015): 499.

[36] Jennifer Clapp, "What the Pollution Havens Debate Overlooks," *Global Environmental Politics* 2, no. 2 (2002): 13.

[37] Studies illustrating that advanced countries are more prone to import waste include O'Neill (2000), Jacott et al. (2001), Ederington et al. (2005), Baggs (2009).

[38] Regional waste trade is discussed in Lepawsky & McNabb (2010), Clapp (2010), and Lepawsky (2014).

Table 1.1 Debate about the Flow of Hazardous Waste Trade

Num.	Argument	Theory	Relevant Literature
1	Less advanced countries import waste primarily from advanced countries.	Pollution Haven Hypothesis North/South Divide Race to the Bottom	Clapp (1994, 2001), French (2000), Ladou and Lovegrove (2008), Kellenberg (2009, 2010), Lucier and Gareau (2015)
2	Advanced countries import a substantial amount of waste.	Economic Gravity Model Economic HOS Model New Endogenous Growth Theory	O'Neill (2000), Jacott et al. (2001), Ederington et al. (2005), Baggs (2009)
3	Waste is imported/ traded regionally.	Economic Gravity Model New Economic Geography Theory	**Lepawsky & McNabb** (2010), Clapp (2010), **Lepawsky (2014,2015)**

Note: Bolded literature focuses on electronic waste.

Over the last two decades developed nations have consistently imported more electronic waste volume than developing countries (Figure 1.5).[39] These statistics contradict the popular belief that developing countries import more waste than developed countries. More so, because both developing and developed nations import e-waste it is unclear as to what variables induce a nation-state to import electronic waste.

[39] Electronic waste is represented by UN Commodity HS 854810. UN Commodity HS 854810 is defined as electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles // Waste and scrap of primary cells, primary batteries and electric accumulators; spent primary cells, spent primary batteries and spent electric accumulators; electrical parts of machinery or apparatus, not specified or included elsewhere in this Chapter.

UN Commodity HS 854810 import volume data 1996-2015.

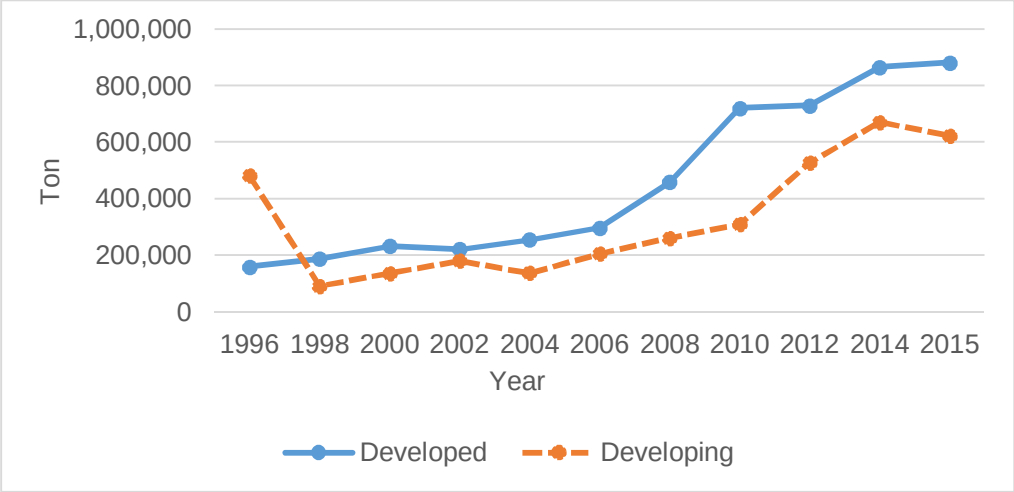

Fig. 1.5 Global Import Volume Developed versus Developing Country

PURPOSE AND CONTRIBUTION OF RESEARCH

Data and previous studies indicate that both developed and less developed countries are active participants in global waste trade. Therefore, rather than adding to the abundance of literature that analyzes the differences between bilateral trading partners, the aim of this study is to provide insight to a more pragmatic question, what drives a country to import electronic waste. Beyond this, the research explores (i.) What factor(s) have the largest impact on electronic waste import volume (ii.) Do the factors' effect size on electronic waste import volume differ between developed and developing countries? (iii.) Did the factors effect on electronic waste import volume change after Basel repositioned its view on waste?

Most experts agree that economic, political and environmental variables impact waste trade. However, a comprehensive model does not exist and consequently has not been used in prior studies. Additionally, many studies tend to be myopic. They include one or two of the factors. Also, current research tests the individual variables effect on waste volume. However, the economic, political and environmental factors consist of more than a single variable. The project creates an inclusive conceptual model that is a consists of multiple variables per factor.

The model is then tested using the partial least squares-structural equation modeling method (PLS-SEM). This method provides evidence as to what variables are important to the factor while simultaneously testing the impact of the factors on electronic waste trade import volume.

Furthermore, it is largely assumed that differences between developed and less developed states economic status, political structure and environmental regulations influence a country's level of participation in global trade. Nonetheless, few waste trade studies test and compare differences between country types. The study identifies if developed and less developed countries e-waste volume are driven by different factors. In doing so, it contributes to the debate on theories of why both advanced and less advanced countries import a substantial amount of e-waste.

Lastly, this study is innovative in two ways. To my knowledge, it is the first study to create a comprehensive model and use it to analyze waste trade. In doing so, it is the first project to simultaneously explore the multiple theories that scholars cite as drivers of waste importation. This study is also groundbreaking in that it identifies the importance of variables that current research does not address. Most importantly, the culmination of these advantages produces a research study that is a robust analysis of drivers of electronic waste importation that is absent from current literature.

CHAPTER 2

LITERATURE REVIEW: DOWN IN THE DUMPS

In studying nation-state behavior in relation to hazardous waste trade practices, scholars have documented links between the economic condition of a country, its domestic regulations and environmental initiatives and policies. However, there is little consensus on what factor has the largest effect on hazardous waste import volume. Additionally, there is discord on whether these factors perform differently in developed as compared to less developed countries.

There are generally five perspectives that explain what factors influence waste trade importation practices. Neoclassical economics focuses on economic variables, such as capital abundance and size of the economy. It also contends that "government policies can do little to accelerate long term growth".[1] Under this theory, a country's economic state influences waste import volume and is not greatly affected by the political factor.

The domestic institutional approach is paradoxical to the neoclassical economic theory. The domestic institutional approach asserts that the national regulatory structure of a nation is the primary determinant that promotes or prohibits a state's ability to import hazardous waste. It does not account for the economic state of a nation.

The new endogenous growth theory recognizes the intersection of politics and the economy. It asserts that the use of government policies impacts long-term economic development.[2] Following this theory, waste import volume is affected by both a country's political structure and economic position.

Neoliberal international institutionalism argues that international institutions and international and regional environmental treaties influence state behavior. Therefore, waste import volume is affected by a nation-states participation in international agreements. Lastly,

[1] Robert Gilpin, *Global Political Economy* (2001), 110.

[2] Ibid., 113-14.

global environmental political theory argues that environmental concerns are addressed by the interaction between state and nonstate actors at the domestic and international levels.[3] Therefore, the amount of waste a country imports is impacted by the domestic regulatory structure and environmental agreements.

The following section examines the current debates and theoretical gaps on factors that impact waste trade importation practices.

Table 2.1 Theories Explaining Waste Importation

Num.	Argument	Associated Theory	Relevant Literature
1	Economic variables mostly influence waste importation.	Neoclassical Economics	Montgomery (1992, 1995), Sigman (1996), Levinson (1999), Antweiler et al. (2001), Albers (2015)
2	National regulatory framework is the primary influencer to waste importation.	Domestic Institutionalism	O'Neill (2000), Carrigan and Coglianese (2011), **Rahman and Subramanian (2012)**
3	Economic variables and the regulatory framework influence waste importation.	New Endogenous Growth Theory	Clapp (1994, 2001), Baggs (2009), Kellenberg (2012), Estrada-Ayub & Kahhat (2014)
4	Environmental agreements and international institutions influence waste importation.	Neoliberal International Institutionalism	de Zeeuw (2008, 2015), Kellenberg (2012, 2014, 2015), Lepawsky (2015), **Khan (2016)**
5	International environmental agreements and the domestic regulatory framework influence waste importation.	Environmental Political Theory	**Maxianova (2008),** Marcoux & Urpelainen (2012), **Jing (2014)**, Lucier & Gareau (2015)

Note: Bolded literature focuses on electronic waste.

[3] Pamela S. Chasek, David L. Downie, and Janet Welsh Brown, *Global Environmental Politics*, 6th ed., Dilemmas in World Politics (Boulder, Colorado: Westview Press, 2014), 37.

ECONOMIC EXPLANATION

The neoclassical economic view argues that nation-states focus on capital accumulation via capital and labor. Along similar lines, scholars contend that waste import flows largely depend on capital abundance.[4] Therefore, state level economic variables such as gross domestic product (GDP) - the economy size, the wealth of a nation, GDP/capita, government debt, disposal costs and the country's openness to trade are key determinants that partially explain waste trade. However, there is not a consensus on the role each determinant has when a country evaluates whether to import hazardous waste. For example, the importance of GDP might vary between developed and developing states.

Baggs's (2009) research, one of the first statistical studies on waste trade, evaluates determinants that influence hazardous waste trade patterns. She examines the relationship between GDP and hazardous waste import volume. The results indicate that as a country's GDP increases, trade in hazardous waste also increases. Higashida and Managi's (2014) study on determinants of trade in recyclable wastes produce similar findings.[5] The results of their research demonstrate that as a country's economy grows the amount of imported waste increases.

Contrarily, because importing waste is a source of revenue, countries with low GDP, less developed countries, import waste as a means of economic development. Lepawsky's (2009) study of e-scrap on the grey market indicates that as a country's GDP decreases the likelihood that it imports e-waste increases.[6] This finding aligns with sentiments expressed by proponents of the North-South divide/Race to the Bottom Theory that claim less advanced countries

[4] Adam B. Jaffe et al., "Environmental Regulation and the Competitiveness of U.S. Manufacturing: What Does the Evidence Tell Us?," *Journal of Economic Literature* 33, no. 1 (1995); Werner Antweiler, Brian R. Copeland, and M. Scott Taylor, "Is Free Trade Good for the Environment?," *American Economic Review* 91, no. 4 (2001).

[5] Keisaku Higashida and Shunsuke Managi, "Determinants of Trade in Recyclable Wastes: Evidence from Commodity-Based Trade of Waste and Scrap," *Environment & Development Economics* 19, no. 2 (2014): 265.

[6] Josh Lepawsky, "Tracking E-Scrap on the Grey Market," *Resource Recycling* 28, no. 12 (2009).

(nations in the south) are often poor and riddled with debt which induces them to invest in dirty industries (hazardous waste importation).[7] Consequently, it is logical to expect a positive correlation between debt and waste import volume. However, interestingly, Lepawksy and McNabb (2010) found no evidence of a significant relationship between net trade balance and debt service ratio. Additionally, the study did not find a significant relationship between net trade balance and public debt as a percentage of GDP.[8]

GDP is also considered in electronic waste because it affects disposal costs. Some studies assert that waste disposal cost is one of the most critical variables a country evaluates when deciding if and how much hazardous waste to import. Waste disposal costs reflect a complex system comprised of transportation costs, disposal fees (landfill or incinerator costs) and separation (labor) costs. Separation costs are the cost of disassembling and sorting recycled materials and storing them by material type. Transportation cost is the amount paid for the movement of waste from the point of entry to the point of treatment or landfill.[9] On a high level, the profitability of importing waste is the import value (revenue) of waste plus the value of re-saleable components minus disposal cost.

> Net Profit = import value (revenue) + revenue of re-saleable components - disposal cost
>
> Disposal cost = transportation costs + disposal fees (landfill or incinerator costs) + labor costs - Tax Incentives and Subsidies[10]

[7] Jennifer Clapp, "The Toxic Waste Trade with Less-Industrialised Countries: Economic Linkages and Political Alliances," *Third World Quarterly* 15, no. 3 (1994): 506.

[8] Josh Lepawsky and Chris McNabb, "Mapping International Flows of Electronic Waste," *Canadian Geographer* 54, no. 2 (2010): 188.

[9] Delta Institute, "Waste Managment: Unrealized Environmental and Economic Benefits for Chicagoland," (Chicago, IL Delta Institute 2014), 9.

[10] Van Passel et al. (2013) discuss how the profitability of urban mining waste is dependent on governments creating incentives for private actors. Sigman (1996) and Levinson (1999) discuss the impact of tax incentives on hazardous waste disposal.

High capital costs associated with the development and operation of landfills may affect the ability to provide waste management services.[11] Therefore, a widely accepted principle is that hazardous waste flows to less developed countries where disposal costs are presumably lower than costs in developed countries. Four major items facilitate lower disposal cost in less developed countries. First, labor costs are lower stemming mainly from lower wages and low environmental, health and labor standards.[12] Secondly, operational costs of disposal facilities are likely lower because of minimal or no capital equipment expenditures. This in turns limits maintenance costs on machines. Lastly, as countries compete for investment, governments are liable to provide tax incentives and subsidies for corporations.[13] The culmination of these factors decreases total disposal cost and yields a favorable cost-benefit analysis for developing nations to import waste.[14]

However, the results of a cost-benefit analysis can also be positive for developed countries. Firms in developed countries have sufficient capital to invest in technology and procure advanced machinery. These capabilities lead to two major benefits, lower production costs[15] and improved sorting precision. Efficiencies in sorting decreases labor hours while simultaneously increasing volume of waste processed. This in turn, increases revenue. Additionally, enhanced sorting precision increases the likelihood that more precious metals are extracted from the waste.[16] Consequently, developed countries can operate disposal and

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[11] United States International Trade Commission, xv.

[12] Jan Albers, "The International Trade in Hazardous Wastes and Its Economic Background," in *Responsibility and Liability in the Context of Transboundary Movements of Hazardous Wastes by Sea*, Hamburg Studies on Maritime Affairs (Springer Berlin Heidelberg, 2015), 27. Derek Kellenberg, "Trading Wastes," *Journal of Environmental Economics and Management* 64, no. 1 (2012): 71.

[13] Arik Levinson, "Nimby Taxes Matter: The Case of State Hazardous Waste Disposal Taxes," *Journal of Public Economics* 74, no. 1 (1999).

[14] It is more likely that illegal dumping occurs in developing nations to circumvent disposal fees.

[15] INSEAD Cornell University, and WIPO "The Global Innovation Index 2015," in *Effective Innovation Policies for Development*, ed. Bruno Lanvin Soumitra Dutta, and Sacha Wunsch-Vincent (Geneva, Switzerland2015), 81.

[16] Wakolbinger et al., 265.

recycling facilities more efficiently and cost effectively which yields a higher profitability margin than what developing countries can obtain.

Baggs (2009) evaluates capital/worker to assess the relationship between capital abundance (the ability to buy technical equipment to maximize productivity) and hazardous waste volume. For importing nations, capital/worker is positive and significant indicating that as capital/worker increases, import volume increases as well. Kellenberg (2012) extends on Baggs's study. However, rather than focusing only on hazardous waste, he evaluates all waste import volume. In assessing capital/labor, the coefficient is positive but insignificant.[17] The results of these studies suggest capital abundance may impact import volume by increasing efficiency.

Kellenberg (2012) conceptualizes GDP/capita as a proxy for recycling productivity because it is highly correlated with recycling wages. The results illustrate that GDP/capita in relation to import volume has an inverse relationship. The more efficient at recycling an exporting country is in relation to the importing country the less likely it is to export waste. These findings suggest that although richer countries might have higher labor costs, as compared to developed countries, their productivity increases. This makes enables advanced economy countries to achieve economies of scale resulting in a favorable cost-benefit analysis to import waste.

Along similar lines, GDP/capita is also associated with influencing import volume. Scholars believe that as citizens become richer, environmental awareness increases and regulations become more stringent. These changes should lead to less waste importation.[18] Results from Baggs's (2009) study align with this purview. Her findings illustrate that GDP/capita for exporting nations is positive and GDP/capita for importing nations is negative.

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[17] Kellenberg, 79.

[18] GDP/capita has been operationalized as a measure of environmental regulatory stringency. This is demonstrated in Dasgupta and Wheeler (1997), Mani and Wheeler (1998), Dasgupta (2002), Cole (2004), Kellenberg (2009), Baggs (2009), Higashida and Managi (2014).

Baggs interprets these results to mean that as a country becomes richer it is likely to import less waste and export more. Alternatively, as a country becomes poorer the more likely it is to become a net waste importer. Lepawsky and McNabb's (2010) conclusions are congruent to Baggs's. They discover a statistically significant inverse relationship between GDP/capita and volume, as a country's GDP/capita decreases the likelihood of it being a net importer of e-waste increases.

In contrast, Higashida and Managi's (2014) evaluation of recyclable waste yields opposing results. Their findings indicate that GDP/capita is positive for both importing and exporting countries. As countries become richer per capita they both import and export more waste. Notably, the coefficients for the importing countries are not significant, an indication that environmental awareness can be effective.[19]

LIMITATIONS OF ECONOMIC PERSPECTIVE

Existing research suggests that economic variables are important in waste importation for both developed and developing countries. However, conflicting results in the way economic variables influence waste importation is a critical weakness of using the economic perspective as the primary determinant to explain what induces states to import hazardous waste.

Some studies indicate that as GDP increases states import more waste. Contrarily, other studies show that as GDP decreases a state becomes a net importer of waste. In addition, the findings of GDP/capita's impact on import volume also vary between studies. Some studies find that as GDP/capita increases waste importation decreases. Paradoxically, other studies indicate that as GDP/capita rises waste importation increases. Notably, the

[19] Higashida and Managi, 265.

contradictory results can be attributed to the various types of waste studied. The typology of waste can be identified relative to its value and hazard level.

Table 2.2 Typology of Waste

	High Hazard	Low Hazard
High Value	E-waste	Metals
Low Value	Medical waste/ Chemical waste	Municipal Solid Waste

One perspective is that as GDP/capita increases citizens demand stricter regulations. Under this condition a state might be confined to import low hazard waste. Alternatively, lower GDP/capita might induce states to accept high value waste despite hazard levels. Baggs (2009) evaluates all hazardous waste which is a combination of both high and low value and hazard. Lepawsky (2009) focuses on e-waste scrap which is primarily high value and high hazard. Kellenberg (2012) reviews all waste because "sometimes waste is not demarcated as hazardous even though it is." Along similar lines, Higashida and Managi's (2014) study on recyclable waste includes several commodity codes. Applying this approach to e-waste research is beneficial because the dichotomy of e-waste (a hazardous and recyclable commodity) enables countries to report inbound shipments of e-waste under non-hazardous commodity codes (i.e. copper waste and scrap- 740400, nickel waste and scrap-750300 or aluminum waste and scrap- 760200). In turn, the countries circumvent regulations associated with importing hazardous waste.

The impact of disposal costs on waste importation is another area of divergence in the waste trade literature. Disposal costs are a significant component in calculating whether the

financial gains of importing waste outweigh the associated environmental risks and costs. O'Neill contends that the broad differences between how the multiple actors are involved in waste trade makes it nearly impossible to calculate the costs and benefits of importing waste.[20] Admittedly, conducting a cost-benefit analysis is difficult. However, studies demonstrate that the non-state and state actors collaborate because it is in their best interest to do so.[21] After all, the state determines the regulations, environmental and tax regulations that private waste management actors must adhere to which affects their profitability.[22]

Additionally, the emphasis placed on disposal cost and cost-benefit assessments might be futile in that a nation-state will import waste only if it is beneficial to do so.[23] Montgomery (1992) and Albers (2015) contend that both developing and developed countries import waste because the financial incentives are worth the risk.[24]

Capital/worker presents challenges to understanding how capital intensity influences waste importation. Waste trade studies use general capital/labor, which includes all industries. Although capital/labor is a reasonable proxy, it is not a precise measurement. Capital/labor in a country could be high because the country has lucrative industries, other than waste disposal services, that increases capital.

Another issue is that current studies use the general population. This too can yield misleading results. More so, some of the countries that import a significant proportion of global waste, such as China and India, also have large populations. Consequently, their capital/labor will always be lower. A better measure is to evaluate the capital/worker within the waste

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[20] Kate O'Neill, *Waste Trading among Rich Nations: Building a New Theory of Environmental Regulation*, ed. Sheldon and Kraft Kamieniecki, Michael E., 1st ed., American and Comparative Environmental Policy (Cambridge, Massachussetts: MIT Press, 2000), 187.

[21] Van Passel, et al. (2013) outlines the methodological cost-benefit process in assessing the economics of urban mining. The process considers technology, regulation and the market.

[22] Studies that discuss the role of business in policymaking include works by Bernhagen (2007, 2008).

[23] Mark A. Montgomery, "Want Not, Waste Not a Realist Theory of the International Trade in Hazardous Waste" (University of California 1992).

[24] Ibid. Albers.

disposal and recycling industry. Notably, this information would be difficult to obtain however; it would provide a more accurate representation of how capital plays a role in waste importation.

Waste trade studies that focus on economic parameters suffer from omitted variable bias. Neoclassical economist attributes economic growth to the endowment of its production factors (availability of capital, labor and land). This perspective does not consider technology's influence on economic growth. However, technology and innovation are endogenous to economic growth because they are a conscious result of an individual or firm's investment of capital in labor and equipment.[25] The Global Innovation Index states, "the competitiveness of both companies and countries depends on their ability to innovate and move in the direction of frontier technology and knowledge."[26] When studies do consider technology, the focus is primarily on developed countries innovation and research and development initiatives. Innovation is predominately associated with developed nations because they possess sufficient capital and the academic/industry framework to support research and development. However, innovation and technology are not limited to advanced countries. "[Developing countries] have realized that technology adoption alone is no longer sufficient to maintain a high-growth scenario; rather, investment in innovation is now crucial to spur further catch-up."[27]

Equally important is the omission of the impact trade openness has on waste import volume. Baggs (2009) indicates that the more open a country is to trade the more likely it is import waste. However, very few studies evaluate openness to trade as a key variable when evaluating waste trade volumes.

Proponents of the race to the bottom theory assert that developing countries import waste not only to earn revenue but also to participate in the global economy. These countries are believed to not have other valuable, tradeable commodities and therefore import waste to

[25] Gilpin, 113.

[26] Cornell University, 81.

[27] Ibid., xviii.

improve their economic and political positions in the global market. [28] To assess this claim, waste trade studies should incorporate a country's percent of world trade or the percent of export of goods and services.

POLITICAL STRUCTURE EXPLANATION

The domestic institutional approach contends that evaluating the national regulatory structure and regulatory style of the importing nation is the best method to evaluate a country's level of waste importation. The premise of the theory is that how policies are "formulated, enacted and implemented" are key to assessing state and private actors' behavior in regard to importation practices. [29] This approach posits that the domestic regulatory structure is either centralized decentralized. The regulatory structure is defined as being either centralized or diffused. In a centralized structure, a single government agency holds all authority for the management and regulation of the waste management industry. Conversely, in a diffused (decentralized) structure regulatory responsibility is at the national and local level. Three dimensions are evaluated in determining the regulatory structure. First, the ownership structure of the waste management industry- meaning the extent of private versus public ownership and the level of competition amongst firms. Next, the degree to which the government is centralized versus decentralized. This relates to the division of regulatory responsibilities between national and local government agencies. Lastly, the regulatory structure includes whether the state is federal or unitary. Federal systems consist of multiple local authorities with environmental

[28] Krasner (1976) asserts that GDP, income per capita and % of world trade are key measures of a country's political and economic power.

[29] O'Neill, 55.

regulatory responsibility. Alternatively, in unitary systems political authority is held by the central government.[30]

The regulatory style of a nation is dependent on the style of policy making and how policies are implemented. Access to policy making describes the relationship of business, society and interest groups in relation to the government in policy making. Closed regulatory styles is characterized with government officials working with business interests in policy formation while broader societal interests are excluded. Open systems are characterized with no single group having privilege in policy planning. Policy implementation can be either rigid or flexible. Rigid systems are likely to have strict national standards. On the other hand, flexible systems apply standards on a case basis.[31]

O'Neill contends that a country is more likely to import waste under three conditions. First, states with a decentralized regulatory framework in which regulatory responsibilities are divided among different agencies at both the national and local levels, are more likely to import waste. Secondly, a closed environmental policy system fosters waste importation. Closed systems promote collaboration between government officials and business interests. Additionally, closed systems exclude other societal groups such as environmentalists from policymaking. Finally, countries that are flexible in terms of policy implementation are more likely to import waste. Firms that are privy to flexible environmental regulations are under less strict regulations and can assume more risk because the government is less likely to monitor and control the movement of hazardous risk.[32] O'Neill posits that nations whose waste disposal industry is privately owned and highly competitive are more likely to have a decentralized regulatory structure and are likely to import more waste.[33]

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[30] Ibid., 56-58.

[31] Ibid., 60-64.

[32] *Waste Trading among Rich Nations Building a New Theory of Environmental Regulation* (Cambridge, Mass.: MIT Press, 2000), 57-64.

[33] Ibid., 56.

LIMITATIONS OF DOMESTIC INSTITUTIONAL APPROACH

A shortcoming of the domestic institutional approach is that it embeds the structure of the waste management industry, the extent to which the industry in privately versus publicly owned, as component within a nation's regulatory structure. Embedding the waste management structure in the regulatory framework conjectures that the extent to which the industry is publicly or privately-owned influences the regulatory structure. However, this can be perceived as overreaching. It is reasonable to assume that the structure of the waste management industry, the amount of competition and extent of private versus public firms in the market, has no or minimal influence on changing the regulatory structure of country because a government can decide to change the amount of ownership it has in the waste management industry and not change the level at which environmental and waste disposal regulations are made. Equally, a government can decide to change the level at which these regulations are made even though the waste management industry has not changed. This scenario can occur as nongovernmental organizations and international institutions play an active role in shaping international trade agreements that ultimately alter and/or influence national regulatory practices.

A weakness of the domestic institutional approach is that it omits variables that impact the domestic regulatory style and structure of a state. First, the domestic institutional approach contends that it is not necessary to evaluate international environmental agreements (IEAs), specifically the Basel convention, among trade between developed partners because waste trade agreements tend to follow other trade agreements that are based on military or security alliances and former colonial ties.[34] Ederington, Levinson and Minier (2005) findings support O'Neill's position that most trade takes place among developed countries that share similarly

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[34] Ibid., 65.

high levels of environmental stringency.[35] However, similarities among trading partners is not a sufficient reason to disregard IEAs. Excluding international environmental agreements is erroneous in that it ignores the influence they have on the national regulatory structure of importing nation-states. Putnam (1988) suggests that domestic and international politics are entangled in a "two-level game." The author explains that nation-state leaders participate in two-level games often simultaneously; one game between the domestic leader and the state, the other game between the domestic leader and the international community. The difficulty of two-level games is that the leader must negotiate a win-set that satisfies domestic and international goals and responsibilities.[36] Because of this entanglement, it is likely that some states adhere to international agreements to participate in the global economy. For example, a growing number of international trade organizations such as the WTO (World Trade Organization) and UN Development Programme (United Nations) include environmental governance parameters that all states must adhere to. Alternatively, some nations might desire to alter domestic environmental regulations but lack the political might to change domestic regulations without the influence of powerful global actors. Lastly, eliminating international agreements undermines the utility of multilateral initiatives in domestic and international politics in waste trade. Multilateral action "leads to enhanced environmental efficacy of individual national responses and minimizes distortions in competitiveness that arise from disparate national policies."[37]

Another limitation of the domestic institutional approach is that it fails to consider how corruption might affect both how policies are created and implemented at the state level. A caveat is that because her O'Neill focuses on democratic countries, it can be inferred that

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[35] Josh Ederington, Arik Levinson, and Jenny Minier, "Footloose and Pollution-Free," 2005, 92.

[36] Robert D. Putnam, "Diplomacy and Domestic Politics: The Logic of Two-Level Games," *International Organization* 42, no. 3 (1988).

[37] David A. Wirth, "Hazardous Substances and Activities," in *Oxford Handbook of International Environmental Law*, ed. Daniel Bodansky, Jutta Brunée, and Ellen Hey (Oxford University Press, 2007), 397.

corruption between politicians and waste management industry leaders does not exist or has a negligible effect on policies in developed countries. Literature offers evidence that support this presumption. Graeff and Mehlkop (2003) conclude that big governments in rich countries do not have a high level of corruption.[38] Saha and Gounder (2013) indicate that a strong negative correlation between income and corruption exists across countries; higher income reduces corruption.[39] Ali and Isse (2003) assert that government regulations tend to increase the size of bureaucracies and in turn, large bureaucracies increase the opportunity for corruption.[40] Following this logic, developed countries tend to have large governments and therefore are susceptible to corruption. Corruption can play an integral role in a nation-state's regulatory structure and style. Therefore, it should be included among variables when assessing waste trade.

CORRUPTION AND NATIONAL ENVIRONMENTAL POLICY

Rose-Ackerman (1978) posits that two levels of corruption exist, high and low levels.[41] Low-level corruption occurs when bribes to public officials have no impact on the governing agency's budget. High-level corruption materializes when bureaucrats' acceptance of bribes alters legislative demands and an agency's appropriations budget. Wilson and Damania (2005) characterize corruption as either grand or petty corruption. [42] An example of grand/ high level corruption is firms contributing to politicians so that the policy makers create regulations, such

[38] P. Graeff and G. Mehlkop, "The Impact of Economic Freedom on Corruption: Different Patterns for Rich and Poor Countries," *European Journal of Political Economy* 19, no. 3 (2003): 615.

[39] Shrabani Saha and Rukmani Gounder, "Corruption and Economic Development Nexus: Variations across Income Levels in a Non-Linear Framework," *Economic Modelling* 31 (2013): 77.

[40] Abdiweli Ali, "Determinants of Economic Corruption: A Cross-Country Comparison," *Cato Journal* 22, no. 3 (2003): 460.

[41] S. Rose-Ackerman, "Corruption - a Study in Political Economy," (United States1978), 60, 67.

[42] John K. Wilson and Richard Damania, "Corruption, Political Competition and Environmental Policy," *Journal of Environmental Economics and Management* 49, no. 3 (2005): 517.

as tax incentives or environmental regulations, in the industry's favor. This type of corruption is likely to occur in developed nations. Contrarily, petty level corruption is prone to exist in less advanced countries and can appear as bribes to political figures who have the authority to grant firms 'legal' permits to either transport or dump illicit hazardous waste. Albeit, the type of corruption might differ between developed and developing countries, a growing body of literature demonstrate a connection between corruption and environmental policy in both rich and poorer nations.

Damania, Fredriksson, and List (2003) test linkages between trade policy, corruption, and environmental policy using a mix of developed and developing countries. Their findings identify an interaction between environmental policy and corruption. A lower amount of corruption relates to more stringent environmental policies. Interestingly, an increase in the demand for environmental policy is also conditional on the level of corruption.[43] Fredriksson and Svensson (2003) contribute to the debate of policy formation by studying political instability's (corruption's) effect on environmental policy formation in developed and developing nations. The results highlight that the stringency of environmental regulations is conditional on the amount of corruption; more corruption yields less stringent environmental policies.[44]

ENVIRONMENTAL EXPLANATION

Growing environmental concern spurs an ongoing fiery debate, in both the scholarly and mainstream realms, on the nexus between globalization and its effect on the environment. Particularly, increased international free trade is criticized for not only causing disparities between advanced and non-advanced economies but also damaging the global environment.

[43] Richard Damania, Per G. Fredriksson, and John A. List, "Trade Liberalization, Corruption, and Environmental Policy Formation: Theory and Evidence," ibid.46 (2003): 507.

[44] Per G. Fredriksson and Jakob Svensson, "Political Instability, Corruption and Policy Formation: The Case of Environmental Policy," *Journal of Public Economics* 87, no. 7–8 (2003): 1385.

Environmentalists contend that the rapid growth and exorbitant volume of electronic waste can have grave consequences on human health and the vitality of the ecosystem. The Bali Declaration on Waste Management for Human Health and Livelihood "affirmed at the political level that waste, if not managed in a safe and environmentally sound manner, may have serious consequences for the environment, human health and sustainable livelihood."[45] These concerns led to global environmental governance initiatives such as the United Nations Environment Programme, OECD Environment Directorate Environment Policy Committee and the Swiss Secretariat for Economic Affairs were established. Leaders in the organizations recognize that consequences of environmental damage transcend state borders and thus require a global solution.

Neoliberal international institutionalists argue that the primary purpose of an international environmental agreement (IEA), an intergovernmental document legally binding nation-states, is to prevent or manage human impact on natural resources.[46] Additionally, environmental agreements seek to reduce negative externalities on the environment caused by states, firms and citizens.[47] To accomplish these goals, IEAs are usually composed of two public policy approaches, policy intervention and policy regulation. Public policy regulation includes setting minimum standards for harmful quantities or establishing liability parameters for those who violate these standards. Conversely, policy intervention encompasses incentives for industry to reduce hazardous waste production.[48]

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[45] Basel Convention, "Milestones," Accessed June 2016, http://www.basel.int/TheConvention/Overview/Milestones/tabid/2270/Default.aspx.

[46] Ronald B. Mitchell, "International Environmental Agreements: A Survey of Their Features, Formation, and Effects," *Annual Review of Environment & Resources* 28, no. 1 (2003): 432-33.

[47] Patrick Bernhagen, "Business and International Environmental Agreements: Domestic Sources of Participation and Compliance by Advanced Industrialized Democracies," *Global Environmental Politics* 8, no. 1 (2008): 82.

[48] Wirth, 396.

BASEL CONVENTION

The Basel Convention, the international environmental treaty on hazardous waste, addresses transboundary movement of hazardous waste and its disposal.[49] The Convention uses a combination of intervention and regulation to accomplish its overall objective of protecting human health and the environment from the effects of toxic waste disposal.

The overarching objective of the treaty focuses on three principle aims. First, it seeks to be a resource of information on sound toxic waste management practices for governments that dispose of hazardous waste. This is accomplished in two ways. First, the convention publishes protocols and provides training on sound waste management practices. The inaugural protocol was published in 1994. More recently, in 2011, the Convention established a Partnership for Action on Computing Equipment (PACE) that provides guidance on the end of life management of computing equipment. In 2015, the Convention established technical guidelines for the transboundary movement and disposal of electric and electronic waste. Secondly, the Convention supports its aim of being a resource to waste importers by establishing Regional Training Centers (BCRCs) that teach advanced waste disposal technology practices and better manage toxic waste disposal techniques, specifically to less developed countries.

The second goal of the Basel Convention is to minimize the volume of waste trade, specifically to less developed countries. In 1995, the convention adopted the Ban Amendment (Annex VII) which prohibits OECD countries from sending recyclable and non-recyclable waste to non-OECD countries. The Basel Protocol on Liability and Compensation for Damage, formed in 1999, regulates civil liability due to damage that occurs during transboundary movement of hazardous waste, including illegal movements. The protocol focuses on holding exporters accountable for providing remuneration to importing countries that experience toxic waste damage.

[49] The Basel Convention was ratified in 1989.

The third initiative of the Basel Convention is to monitor the transboundary movement of waste. The convention established a verification process in which importing nation-states are responsible for reporting import volume, the number of facilities with capacity and formal consent to receive hazardous waste. The Promoting Implementation and Compliance Committee within the Basel Convention, implemented in 2002, was established to assist nations to create a tracking system that enable nations to comply with the measures set forth in the convention. In the same year, the Strategic Plan for Implementation of Basel Convention was established solely to assist less developed nations with implementing the parameters and obligations set forth in the convention.

LIMITATIONS OF INTERNATIONAL ENVIRONMENTAL AGREEMENTS

Critics of IEAs conjecture that because there is not a supranational governing body to force nation-states to comply with IEAs they have minimal influence on national regulations and have a nominal impact on protecting human health and the environment from harmful effects of waste trade.[50] Additionally, without a global authoritative body, countries are left to self-enforcement and self-reporting which can lead to corruption and weak compliance.[51] Consequently, IEAs are only successful to the extent to which governments are committed to cooperative efforts.[52] Jing (2014) argues that international e-waste regulations have a 'jurisdictional mismatch' where international regulations do not have authority over national signatories.

[50] Lucier and Gareau, 496, O'Neill 1998, 140-141

[51] Alan Andrews, "Beyond the Ban - Can the Basel Convention Adequately Safeguard the Interests of the World's Poor in the International Trade of Hazardous Waste?," *LEAD Journal (Law, Environment & Development Journal)* 5, no. 2 (2009): 173; Roy W. Shin and Laura A. Strohm, "Policy Regimes for the International Waste Trade," *Policy Studies Review* 12 (1993): 235.

[52] Bernhagen, 81.

The Basel Convention has several structural weaknesses that minimize its efficacy in monitoring and controlling the transboundary movement of toxic waste and waste disposal. The principal motivation for the Prior Informed Consent (PIC) agreement was to "assist developing countries that might have limited regulatory capacity or difficulty controlling imports to implement their own domestic environmental and public health policies."[53] Under this structure, countries self-report the number of available disposal facilities. However, the convention does not establish a method for countries to access information on the number of adequate disposal outlets an importing country possesses.[54] This framework makes it difficult for exporters to determine whether the importer truly has capacity to dispose of waste properly. Consequently, not having independent third party verification makes the system vulnerable to abuse by corrupt officials.[55]

Additionally, the effectiveness of the Compliance Committee is constrained. Because the Convention is an agreement between states, its provisions do not directly bind non-state actors such as private companies. Consequently, the convention does not have the authority to fine parties, states nor private actors, which violate the agreement. "The state, therefore, acts as an intermediary by passing appropriate domestic laws which implement the Convention at a national level to regulate private actors."[56] The effectiveness of the Protocol on Liability and Compensation for Damage is also limited. It lacks the ability to force exporting nations to compensate importing nations that have suffered severe environmental and health consequences from hazardous waste caused by the exporting country.[57]

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[53] Wirth, 414.

[54] Andrews, 173.

[55] Ibid.

[56] Ibid., 176.

[57] Ibid.

Krueger (1999) claims that the Ban Amendment, which prohibits hazardous waste exportation from rich countries to poor countries, is the Basel Convention's greatest achievement.[58] However, other scholars argue that the Basel Convention may now be obsolete. Kellenberg and Levinson (2014) contend that the Basel Convention has had virtually no impact on waste flow patterns nor has it altered waste trade volume. Therefore, the regulation is unnecessary.[59] In 2011, at the 10th annual Conference of Parties meeting, the convention affirmed, "that wastes should not be considered merely an unwanted and costly by-product of modern society, but can be recognized as a potentially valuable resource."[60] Lucier and Gareau (2015) state that the treaty's shift to viewing waste as a lucrative commodity undermines the legitimacy and the original intent of protecting poor countries from rich countries dumping waste on poor states. The authors further contend that the revision will cause "certain industries to dismantle some environmental regulations while at the same time promoting the increase of other regulations enabling the importation of hazardous waste in less developed countries."[61] This change makes the ban amendment irrelevant. However, findings by Lepawsky and McNabb (2010) and Lepawsky (2014, 2015) disprove the notion that waste flows from rich countries to poor ones. Nonetheless, they agree that the Basel Amendment is ineffective in prohibiting waste importation by poor countries. These studies demonstrate that waste trade occurs within regions and between similar country economy types, developed countries tend to trade with other developed countries and developing nations trade with other developing nations.

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[58] Jonathan Krueger, *International Trade and the Basel Convention* Trade and Environment Series (London Earthscan, 1999), 6.

[59] Derek Kellenberg and Arik Levinson, "Waste of Effort? International Environmental Agreements," *Journal of the Association of Environmental and Resource Economists* 1 (2014): 30.

[60] Secretariat of the Basel Convention, "Basel Convention Bulletin " (Geneva, Switzerland: UNEP/SBC, International Environment House I, 2012), 5.

[61] Lucier and Gareau, 496.

To some extent, waste importation by poorer countries would not be as grave of a concern if the convention was successful in transferring technology to less developed countries. Unfortunately, the Convention has failed to establish a regular funding mechanism for technology centers which has limited technology and knowledge transfer to countries in need.[62]

ECONOMIC, POLITICAL AND ENVIRONMENTAL EXPLANATION

Many studies explain waste trade importation with the race to the bottom theory or pollution haven hypothesis. They consider the nexus between economic benefits and regulations. Clapp (1994) asserts that developing nations in need of revenue lower their environmental standards despite their inability to properly dispose of hazardous waste. These states are willing to assume risk because the economic benefit outweighs the grave environmental and health concerns.[63] Albers (2015) conjectures, "recent developments show that entire production processes, which are very waste- intensive, are moved to developing countries with less stringent laws."[64] Lucier and Gareau (2015) contend that the shift of e-waste from a toxic resource to an economic commodity induces nation-states to create regulations that appear environmentally friendly but actually promote economic interests. The authors further assert that lax environmental regulations promote competition for firms to build new facilities in developing countries.[65] These studies suggest that regulations are structured to exacerbate economic gains.

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[62] Andrews, 177.

[63] Clapp, "The Toxic Waste Trade with Less-Industrialised Countries: Economic Linkages and Political Alliances," 506.

[64] Albers, 28.

[65] Lucier and Gareau, 501.

Jing (2014) suggests that e-waste regulation is afflicted with the 'tragedy of the regulatory commons'[66], a situation in which ineffective overregulation abounds. Exorbitant regulation causes government structures to become decentralized[67] which can lead to more waste importation. Lucier and Gareau assert that changes in the regulatory structure can exacerbate waste trade to less advanced economies.[68] However, Jing argues that conjectures that although decentralization at the domestic level initially appears to counteract international environmental initiatives "[it] is a better approach to effectively promoting human and environmental health."[69] He further contends that shifting regulation from an international approach to a national decentralized structure enables government actors and private actors who have more authority and ability to ensure waste is disposed of properly while simultaneously pursuing profit. Contrarily, Marcoux and Urpelainen (2012) argue that some developing countries are not entirely opposed to international regulations. In fact, those supporting the Basel Convention have gained benefits from regulatory capacity building.

> "International treaties could coordinate training programs, fund demonstration projects, collect and administer information, orchestrate activities in the private sector, and create scientific research programs. Second, the treaty could contain provisions that indirectly mitigate the national regulatory problem."[70]

The United States International Trade Commission (USITC) states that most waste management firms are not large transnational corporations seeking to take advantage of lower environmental standards in developing countries. Rather they are small to mid- size enterprises

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[66] William W. Buzbee, "Recognizing the Regulatory Commons: A Theory of Regulatory Gaps," *Iowa law review.* 89, no. 1 (2003).

[67] Jin Jing, "E-Waste & the Regulatory Commons: A Proposal for the Decentralization of International Environmental Regulation," *Brooklyn Journal of International Law* 39, no. 3 (2014).

Recall from O'Neill's study that nation-states with a decentralized government, one in which regulatory responsibilities are divided among different agencies, tend to have higher competition among private waste management firms and are more likely to import waste. O'Neill's study analyzes only developed countries.

[68] Lucier and Gareau, 496.

[69] Jing, 1266.

[70] Christopher Marcoux and Johannes Urpelainen, "Capacity, Not Constraints: A Theory of North-South Regulatory Cooperation," *The Review of International Organizations* 7, no. 4 (2012): 403.

"that lack the interest, the capital, and the legal and regulatory expertise necessary to establish overseas affiliates."[71]

There are substantially divergent perspectives on how economic and political variables impact environmental regulations and ultimately hazardous waste import volume. Consequently, future studies should continue to research how variables within these factors affect import waste volume.

LIMITATIONS OF EXISTING LITERATURE ON WASTE TRADE

Existing waste trade studies are incomplete in two ways. First, studies tend to use one theory to explain what drives a country to import waste and dismiss the importance of other factors. Secondly, by using a single approach research omit key variables that are pertinent to explaining the phenomenon.

The domestic institutional approach theory insists that tenets of traditional neoclassical economy theory, revenue maximization, cost benefit analysis, and comparative advantage, are difficult to calculate and do not sufficiently explain waste trade.[72] Undeniably, obtaining landfill costs is challenging which makes calculating economic gains at a national level an ambitious task. However, qualitatively assessing the regulatory structure of a nation-state is equally difficult. Therefore, it is insufficient to use the ease or difficulty to access data as a primary reason to exclude variables when analyzing waste trade practices.

In agreement with O'Neill, comparative advantage theory is not sufficient in explaining why a country imports waste. However, I differ in the reason why comparative advantage is insufficient to explaining waste importation practices. A significant problem with comparative advantage is that there are discrepancies in what constitutes a comparative advantage.

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[71] United States International Trade Commission, 4-18.

[72] O'Neill, *Waste Trading among Rich Nations Building a New Theory of Environmental Regulation*, 187-89.

Comparative advantage can be defined by labor, capital, environmental stringency, disposal capacity. O'Neill restricts comparative advantage to disposal capacity.[73] She argues that proponents of the comparative advantage believe that increased disposal capacity leads to more waste importation. Although she recognizes that the regulatory framework of a nation influences waste importation practices, she fails to consider the regulatory structure as a comparative advantage. This is a major drawback because the basis of the race to the bottom theory and the pollution haven hypothesis is that lax environmental regulations, a result of the regulatory structure, are a comparative advantage.

Another problem with using comparative advantage in evaluating waste trade is that it is difficult to pinpoint what amount of labor/capital or how lax a regulation needs to be for a nation to be considered as having a comparative advantage. These benchmarks are to some extent arbitrary.

There are a few studies that recognize the relationship between economic, political and environmental factors. However, they tend to use the race to the bottom theory to explain waste importation practices. In doing so, the studies focus on how these factors influence waste importation to developing countries. This is problematic because developed countries also import hazardous waste. There is an increase in both environmental awareness and hazardous waste import volume in both developed and developing countries. Therefore, research studies should consider the new growth theory and environmental political theory in explaining what drives waste importation. These theories recognize the government's (political) influence on economic and environmental factors.

A weakness in waste trade studies is the omission of critical variables. Both the neoclassical economic and the domestic institutional approach do not consider international environmental agreements, polity and corruption despite the known linkages between

[73] *Waste Trading among Rich Nations: Building a New Theory of Environmental Regulation*, 187.

government type, economic development, corruption, and regulation (freedom to trade and environmental). Utilizing the domestic institutional approach as the sole method when analyzing waste trade fails to capture a state's pursuit of capital accumulation that characterizes the regulation of the global hazardous waste trade.[74] Along similar lines, the neoclassical economic approach mildly considers regulations that impact waste importation.

The domestic institutional approach argues that IEAs lack 'authority or influence' on national regulations, domestic environmental performance and is therefore inconsequential to understanding waste trade patterns. However, I have not found many studies that test the number of IEAs ratified relative to domestic regulations and environmental performance to substantiate the claim that IEAs have no or minimal effect on citizens' health and the environment. Prior studies focus on specific components of environmental concerns such as pollution, land use or energy consumption.[75] This is in large part due to the lack of an environmental performance index. However, the Environmental Performance Index (a development of the Environmental Sustainability Index) established in 2001 provides researchers a comprehensive database scaling the extent to which countries protect human health and the environment from hazardous substances. Consequently, scholars are better able to assess the relationship between the number of IEAs ratified and actual environmental performance.

Furthermore, generally, it is assumed that democratic countries are more likely to participate in international treaties and are also more prone to protect the environment than less democratic nations. Empirical results demonstrate a positive relationship between democracy and state commitment to compliance with environmental treaties.[76] These findings demonstrate

[74] Lucier and Gareau, 501.

[75] Daniel Fiorino, "Explaining National Environmental Performance: Approaches, Evidence, and Implications," *Policy Sciences* 44, no. 4 (2011): 369.

[76] Joel Carbonell and Juliann Allison, "Democracy and State Environmental Commitment to International Environmental Treaties," *International Environmental Agreements: Politics, Law & Economics* 15, no. 2 (2015): 92. Quan Li and Rafael Reuveny, "Democracy and Environmental Degradation," *International Studies Quarterly* 50, no. 4 (2006).

how political variables (factor) moderate in the relationship between the environmental factor and electronic waste trade. Therefore, polity should be included in waste trade studies.

Another shortcoming in waste trade literature is the exclusion of innovation and technology. These variables are critical for a few reasons. First, innovation is firmly recognized as a central driver of economic growth and development.[77] Long-term economic growth is not only contingent on the endowment of a country's production factors it also in its improvement in production technologies.[78] Additionally, innovation and technology are connected to regulations and economic benefits. A substantial amount of innovation in e-waste disposal and recycling occurs between private and public partnership, however, government officials at both the national and local levels seek to control a certain percent of the market for governmental revenue. Consequently, local and municipal governments can make the provision of waste management services as barriers for private firms to enter the market.[79] Nonetheless, scholars argue that regulations promote innovation which leads to higher efficiency while reducing harmful environmental consequences.[80]

A review of waste trade literature reveals an undeniable link between trade (openness), economic development, the political framework and environmental regulations. Montgomery (1992) conjectures that state behavior to importing waste is based on economics, domestic politics, foreign policy, and even environmental protection laws.[81] Ederington and Minier (2003) contend that governments can manipulate trade volume, the functionality of industries and industry structure by altering domestic policies such as environmental standards and subsidies

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[77] Cornell University.

[78] Thomas A. Pugel, *International Economics* (New York: McGraw-Hill/Irwin, 2012), 121.

[79] United States International Trade Commission, 4-3.

[80] Helen Walker, Lucio Di Sisto, and Darian McBain, "Drivers and Barriers to Environmental Supply Chain Management Practices: Lessons from the Public and Private Sectors," *Journal of Purchasing and Supply Management* 14, no. 1 (2008): 81.

[81] Montgomery.

and taxes.[82] Nonetheless, few existing waste trade studies offer a comprehensive lens through which waste importation for developed and developing countries can be analyzed. A more thorough approach is needed to understand how variables impact a state's proclivity to import hazardous waste. Future studies should include economic, domestic political structure and international environmental variables to determine how these factors influence import waste volume.

[82] Josh Ederington and Jenny Minier, "Is Environmental Policy a Secondary Trade Barrier? An Empirical Analysis," *The Canadian Journal of Economics* no. 1 (2003): 138.

CHAPTER 3

RESEARCH DESIGN: FINDERS KEEPERS…LOSERS WEEPERS

The rapid emergence of waste trade has resulted in a proliferation of studies debating the nuances of the phenomenon. Researchers use quantitative, qualitative and modeling and simulation methodologies to explain what influences a state's propensity to import waste. The following sections outline the methodological tradeoffs between the approaches, highlight research designs of waste trade studies and discuss their limitations. The final part establishes this study's methodology, operationalization of constructs and variables and discusses its restrictions.

METHODOLOGICAL APPROACHES

Qualitative research is "useful for generating hypotheses, identifying key variables and building theories because they allow researchers to tease out causal mechanisms."[1] However, qualitative methodology is not without shortcomings. Qualitative research has a small sample size which makes it weak for theory testing. Furthermore, the case selection can be biased in that it is likely that authors include cases that illustrate the outcome the researcher seeks to support.[2] "For qualitative researchers, a theory is usually only one critical observation away from being falsified."[3] Lastly, some of the causal methodology used in qualitative work is difficult to translate into quantitative and modeling research efforts.[4]

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[1] Kate O'Neill et al., "Methods and Global Environmental Governance," *Annual Review of Environment and Resources* 38, no. 1 (2013): 448.

[2] James Mahoney and Gary Goertz, "A Tale of Two Cultures: Contrasting Quantitative and Qualitative Research," *Political Analysis* 14, no. 3 (2006): 239.

[3] Ibid., 241.

[4] A burgeoning amount of literature discusses the interrelation of qualitative, quantitative and modeling and simulation methods into a mixed methods approach. Mahoney and Goertz (2006), Mahoney (2008), O'Neill et al. (2013), Spillman (2014).

Alternatively, quantitative studies have a larger sample size which makes them more robust in theory testing. Whereas qualitative studies outline causal factors, statistical methods aid in identifying which factors are substantively and statistically significant. However, arguably, a drawback to statistical research is that its focus on the "effects-of-causes" demonstrates a causal correlation[5] and is not necessarily an indication of causality. Instead the coefficient of the independent variable indicates the magnitude of change the dependent variable experiences due to a change in the independent variable.

Modeling and simulation is an increasingly applied approach to explaining international relations phenomena. Modeling and simulation allows the examination of many strategies in a complicated setting and permits dynamic adjustment.[6] Computational models have advantages in that they force precision in concepts and allow "*focused realism*-the representation of complex structures and processes without losing analytic focus."[7] These traits provide flexibility with the unknowns in theories.

Nonetheless, a significant difficulty in using modeling and simulation to explain global developments is the complexity of the international system.[8] The international system is composed of many actors with varying policies. Consequently, accurately (re)creating events in models can be challenging and/or biased. For example, in modeling a researcher rather than actors create the rules in the model. There is the possibility that the modeler might create rules that the actual actors might not construct nor follow. Therefore, although complex adaptive simulations are promising they [can be] incomplete.[9]

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[5] Mahoney and Goertz, 230.

[6] Paul E. Johnson, "Simulation Modeling in Political Science," *The American Behavioral Scientist* 42, no. 10 (1999).

[7] Charles S. Taber and Richard J. Timpone, "Beyond Simplicity: Focused Realism and Computational Modeling in International Relations," *Mershon International Studies Review* 40, no. 1 (1996): 42.

[8] Neil E. Harrison, *Complexity in World Politics: Concepts and Methods of a New Paradigm*, Suny Series in Global Politics (Albany: State University of New York Press, 2006), Book.

[9] David C. Earnest and James N. Rosenau, "Signifying Nothing? What Complex Systems Theory Can and Cannot Tell Us About Global Politics," in *Complexity in World Politics : Concepts and Methods of a New Paradigm*, ed. Neil E. Harrison, Suny Series in Global Politics. (Albany: State University of New York Press, 2006).

QUALITATIVE WASTE TRADE STUDIES

O'Neill's (2000) study provides an institutional framework comprised of two determinants, regulatory structure and regulatory style that should be evaluated when assessing how a nation's domestic framework influences its waste importation practices.[10] O'Neill evaluates the regulatory structure of 5 OECD nations, Germany, France, Great Britain, Japan and Australia, relative to their net import volume to test her hypothesis that the more decentralized, closed and flexible a country is, the more likely it is to import waste.[11]

This research illustrates the strengths and weaknesses of case-oriented work. The sample appears unbiased in that the results illustrate that not all the countries align with her hypotheses that the more decentralized, closed and flexible a country is the more likely it is to import waste. Japan is as an outlier because its regulatory structure indicates that it should be a large importer of waste yet it is not.[12] This can be attributed to Japan's focus on its waste management laws. Because of the densely populated urban areas and the short lifespan of disposal sites, Japan created laws to minimize waste production and promote recycling.[13]

Nevertheless, the study's sample size is too small and thus her findings cannot be generalized to a more diverse and larger set of countries. To combat the anticipated critique that the framework is applicable only to her sample, she contends that "the qualitative model of environmental regulation can be applied, with minimal adaption, across countries."[14] Albeit, the regulatory structure is straightforward, the model is far from being easily applicable to other countries, especially to developing countries. The primary obstacle is that information is not easily accessible. For example, the approach considers the structure of the waste management

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[10] A more detailed analysis of O'Neill's framework is presented in Chapter 2.

[11] O'Neill, *Waste Trading among Rich Nations: Building a New Theory of Environmental Regulation*, 57-64.

[12] Ibid., 8.

[13] Jennifer-Ann Hoeveler, "International Approaches to Dealing with Electronic Waste," *New Zealand Journal of Environmental Law* 13 (2009): 155-56.

[14] O'Neill, *Waste Trading among Rich Nations: Building a New Theory of Environmental Regulation*, 2.

industry, the extent to which it is privately or publicly owned and its degree of competitiveness.[15] This information can be challenging to acquire for developing countries that are high net importers of hazardous waste such as India and the Philippines. Additionally, converting the qualitative measures into quantitative scores is equally challenging.[16] It is difficult for instance to decide at what point the waste management industry is considered competitive. Also, the process of converting the measures into scores (coding) would be quite laborious for such a large dataset. Although the construction of a comprehensive index (database) would enable a systematic comparison and analysis across a larger number of observations, the aforementioned complexities make it difficult to apply the regulatory framework to a broader context. Consequently, the author's position that the domestic institutional approach is the best method that explains what conditions promote waste importation is not well supported.

Despite these shortcomings, a significant strength of the research is that it offers a thorough analysis of the political economy of hazardous waste trade. In doing so, it evaluates the role of business, state and society in waste importation practices. This is especially valuable because other theories evaluating waste trade do not consider the involvement various actors have in not only creating environmental regulations but also the extent to which the actors interact when creating policies that impact waste trade.

Clapp (2001) offers a qualitive work on waste trade that focuses on developing countries. She conjectures that waste importation is intricately linked to economic factors and that globalization facilitates an environment in which regulations are exploited and manipulated for economic benefits. Clapp further contends that countries riddled in international debt purposely adjusted trade policies (liberalized trade). More so, these adjustments were made

[15] Ibid., 56.

[16] Difficulties of translating qualitative information into quantitative measures is discussed in O'Neill et al., 456.

under the guidance of the IMF and the World Bank during the 1980s and 1990s as a *quid pro quo* for the rescheduling of debt by donor countries and banks.[17]

To reinforce her assertion that developing countries with weak political and economic environments are often preyed on, Clapp cites events that occurred in the 1980s and early 1990s when hazardous waste was markedly received by poorer countries. She describes the infamous 1986 Khian Sea case in which a cargo ship carrying nearly 14,000 tons of toxic fly-ash set sail from the United States scoured the world- the Caribbean, Africa, Europe, the Middle East and East Asia, seeking a port that would accept the waste. Facing defeat, after 27 months the ash mysteriously disappeared. Clapp outlines the 1988 Guinea- Bissau incident in which the country was offered 4 times its GNP (nearly twice as much as its external debt) if it agreed to accept 15 million tons of waste. She continues with an example from 1991 in which a Somalian health minister was supposedly bribed to accept 500,000 metric tons of waste.[18]

A weakness of the study is that it fails to demonstrate that debt laden countries alter or maintain lax trade and environmental regulations to preserve toxic waste importing practices as an avenue to economic gains. Additionally, most examples of hazardous waste trade are limited to occurrences before the ratification and adoption of the 1989 Basel Convention ratification and the 1995 Basel Ban Amendment. These milestones are key initiatives enacted to prohibit rich countries from 'dumping' on poor countries. Therefore, instances in which hazardous waste trade flowed from rich to poor countries after these measures would better support her assertions that advanced economy sends waste to countries burdened with debt.

[17] Jennifer Clapp, *Toxic Exports: The Transfer of Hazardous Wastes from Rich to Poor Countries* (Ithaca, N.Y.: Cornell University Press, 2001), 10-11.

[18] Ibid., 35-37.

QUANTITATIVE WASTE TRADE STUDIES

Waste trade scholars generally agree that waste trade is impacted by factors that are measured by more than one variable. In that the economic state of a country is measured not only but GDP but also by GDP/capita. However, when evaluated waste trade patterns, most quantitative waste trade studies use linear multiple regression models which focuses on how the individual variable affects waste import volume. For example, Baggs's (2009) study includes economic variables, gross domestic product, and trade openness, to assess hazardous waste import volume. The results of the study indicate that the coefficient of GDP for importing nations is positive and significant. The coefficient for trade openness is also positive and significant.[19] Because the coefficients of both variables are positive and significant we can infer that the economic factor has a positive significant relationship on waste import volume. However, if GDP and trade openness yielded opposite results, a negative coefficient for one variable and a positive coefficient for the other variable, we would not have insight to how the economic factor impacts import waste volume. Therefore, linear regression is beneficial in identifying specific variables' impact and influence on the dependent variable[20], but fails to pinpoint how a group of similar variables (a factor) affect waste import volume.

Additionally, leading waste trade studies employ a gravity model (a linear approach) to test waste trade dynamics. This approach considers country level traits such as the average wealth of a country and distance between trading partners to explain the determinants of interaction between trading partners. Baggs (2009) uses standard ordinary least squares (OLS) gravity model to examine mostly economic determinants that influence international hazardous waste trade patterns. Kellenberg (2012) also examines trade patterns using the gravity technique but focuses on whether differences in environmental regulations play a role between

[19] Jen Baggs, "International Trade in Hazardous Waste," *Review of International Economics* 17, no. 1 (2009): 7-8, 11.

[20] Mahoney and Goertz, 235.

waste trading partners.[21] Higashida and Managi's (2014) research utilizes the gravity model to explore factors that affect trade of recyclable waste of both exporting and importing countries. Kellenberg and Levinson (2014) uses the gravity model to test the effects of ratification of the Basel Convention on international waste shipments between trading partners. Although studies using the gravity model approach are effective in providing insight to the relationship (correlation) of variables between trading partners, which is paramount in identifying if a waste haven effect is occurring between trading partners,[22] it does not typically substantiate what variables have a large effect on waste importation.

Another shortcoming of quantitative studies is that, to the best of my knowledge, existing research fails to evaluate all three factors, political, economic and environmental, that affect waste importation. Baggs (2009) considers economic variables to assess international waste trade but does not consider political determinates. To her credit, she acknowledges that a limitation of her study is that it does not include measures of regulatory stringency which is critical to evaluate international waste trade.[23] To remedy this, Kellenberg (2012) constructs an environmental regulatory index. His study includes economic variables, GDP/capita as a proxy for recycling productivity and as a control variable.[24] However, the study does not focus on the nexus between the stringency of environmental regulations and the wealth of a country. Kellenberg and Levinson (2014) tests the effects of the Basel Convention and include GDP but do not include domestic regulatory parameters. It would be beneficial to assess the relationship between the Basel Convention and domestic environmental policies.

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[21] Kellenberg.

[22] Literature outlining theoretical debates on flow of waste based on economic size of a country is outlined in Chapter 1.

[23] Baggs, 8.

[24] Kellenberg, 74.

MODELING AND SIMULATION WASTE TRADE STUDIES

Game theory, a form of modeling, is an alternative method to examine what induces states to import electronic waste. A game theoretic approach is advantageous in evaluating waste trade because it assesses the behavior of multiple stakeholders. It also is effective in that it illustrates behavior by considering the likelihood that an event/decision will occur. Regarding waste trade literature, the method accounts for how each actor is affected by the key factors, economic, domestic regulations and international agreements, of waste trade.

Cassing and Kuhn (2003) creates a multistage game to analyze international trade of hazardous waste when the market is oligopolistic and when both importing and exporting countries utilize national environmental policies to attach taxes to waste trade. Kaushal and Nema (2013) presents a non-cooperative game of multi-stakeholders (government, manufacturer, recycler and consumer) in electronic waste management. The premise of the study is that e-waste management is better understood by analyzing incentives and cost factors of each stakeholder.[25]

A difficulty in using game theory is ensuring that the assigned behavioral probabilities and payoffs mirror reality. These calculations consider the cost-benefit and regulatory restraints in the system and requires an in-depth knowledge of each player. The number of players involved in waste trade combined with the detailed knowledge of players required make it difficult to estimate accurate payoffs. Additionally, the cost-benefit of importing waste is country specific and thus a general probability cannot be easily applied to a generic model. These limitations prohibit the game theoretic approach from being the best suited methodology in explaining what factors have the most effect on import waste volume.

Lepawsky and McNabb (2010) and Lepawsky (2014) utilize computer network analysis to illustrate the geography of global electronic waste trade. The graphical analysis is

[25] Rajendra Kumar Kaushal and Arvind K. Nema, "Strategic Analysis of Computer Waste Management Options: Game-Theoretic Approach," *Journal of Environmental Engineering* 139, no. 2 (2013).

advantageous in illustrating waste trade flows. However, the network model cannot tell the purpose for which trade occurs.[26] In turn, it does not provide insight to what factors effect import waste volume.

LIMITATIONS OF WASTE TRADE STUDIES

The methodologies used in existing waste trade literature share similar challenges. Researchers agree that a state's participation in waste trade, particularly to import waste, is based on economic incentives, domestic regulations and environmental initiatives. However, the qualitative and quantitative literature explains waste trade from a narrowly constructed framework which yields conflicting results.

Qualitative and game theory approaches suffer from small sample sizes. These methodologies tend to utilize a case based approach which cannot necessarily be applied to the extensive number of players in international waste.

Modeling and simulation studies present a model with variables, economic, and international environmental and domestic regulations, that states evaluate in the decision-making process on whether to import waste. Nonetheless, the weight of each factor is not included in the model. Consequently, each factor is weighted the same. However, those who believe that developing countries import hazardous waste despite the environmental consequences for economic benefits are likely to argue that the economic factor should be weighted more than the environmental factor. Because some modeling and simulation research do not make a distinction of weight among the factors, the results are not necessarily applicable to explaining waste trade importation practices.

[26] Josh Lepawsky, "The Changing Geography of Global Trade in Electronic Discards: Time to Rethink the E-Waste Problem," *The Geographical Journal* (2014): 3.

Limited time series is a weakness that all three methodologies share. Baggs' quantitative assessment of waste trade includes data over a three-year period. Kellenberg (2012) evaluates one year of waste trade. Lepawsky and McNabb's (2010) computational model explores a four-year timeframe. Qualitative studies tend to not examine import volume over time. Instead, they focus on substantial events. Modeling and simulation studies do not necessarily focus on a time nor a significant incident, rather they aim to create a model that can be applied when specific conditions exist.

The most profound issue with current waste trade studies is their focus on 'significance' – to the exclusion of magnitude. Qualitative research typically uses case studies to argue which factors are most significant (important) whereas quantitative studies focus on testing for statistical significance. The issue is that "statistical significance does not answer a scientific quantitative question. It is a philosophical, qualitative test. It does not ask how much. It asks whether an effect exists."[27] In other words, existing waste trade studies whose results focus on statistical significance are asking whether economics, environmental parameters or political variables impact hazardous waste import volume. Statistical significance also indicates how confident we are that a country's economic health, regulatory structure and environmental initiatives impact import waste volume. Essentially, testing for statistical significance is not as important because, for the most part, scholars agree and are confident that the aforementioned factors are significant to waste import volume. Therefore, the more interesting question is, how much effect each factor has on hazardous waste import volume. From a pragmatic perspective, which factor has the largest impact on import volume?

[27] Deirdre Nansen McCloskey, *Cult of Statistical Significance [Electronic Resource] How the Standard Error Costs Us Jobs, Justice, and Lives*, ed. Steve Ziliak, Economics, Cognition, and Society (Ann Arbor: Ann Arbor : University of Michigan Press, 2010), 4-5.

METHODOLOGY

This study utilizes partial least squares-structural equation modeling (PLS-SEM) to examine the impact (effect size) that political, economic and environmental factors have on electronic waste import volume. PLS-SEM is an effective method of analysis for this study in several ways. First, its structure allows the researcher to evaluate the effect of variables that are not directly observable (latent variables) on the dependent variable. This is especially useful in analyzing waste trade theories that cite economic, political and environmental factors as drivers of waste importation. Additionally, a key feature of SEM is its ability to easily differentiate effect sizes for groups. This is especially advantageous in being able to discern if the factors' impact on waste import volume differ between developed and developing countries.

Furthermore, SEM allows statistical testing while accounting for causal assumptions. Like ordinary least squares (OLS), SEM allows a researcher to identify the significance of variables. In OLS the importance of an independent variable is based on its effect on the dependent variable. However, SEM includes the relationship between independent variables and latent variables. Therefore, the significance of a variable is based on its effect on the factor. This provides the researcher insight to which variables are most important to the factor. This study uses the bootstrapping approach to test for statistical significance. As recommended in Hair et al., no sign changes were selected and the Bias-Corrected and Accelerated (BCa) Bootstrap[28] was employed because "it has reasonable computation requirements and produces comparably narrow confidence intervals."[29] Following general convention, the significance is tested using a two-tailed test and .05 represents the level of statistical significance.

PLS-SEM was chosen over CB-SEM (covariance-based structural equation modeling) for several reasons. First, PLS-SEM is better suited in testing formative models. Formative models assume that the independent variables make up the construct and that variation in the

[28] Per Hair et al. BCa bootstrap confidence interval adjusts for biases and skewness in the bootstrap distribution, 156.

[29] Joseph F. Hair, *A Primer on Partial Least Squares Structural Equation Modeling (Pls-Sem)* (2017), 159.

independent variables cause variation in the construct ($x_1 \rightarrow Y_1$).[30] The direction of the arrows from the independent variable to the construct is an indication of the causal (predictive) relationship in that direction. This study assumes that the independent variables make up the construct and is therefore a formative model.

Secondly, PLS-SEM employs an OLS based approach (predictive) which is "the preferred method when the focus of research is for theory development and explanation of variance (prediction of the constructs)."[31] Similar to traditional OLS regression, PLS-SEM provides an R^2 value. The R^2 provides insight to how well the factors explain waste import volume.

Additionally, in comparison to CB-SEM, PLS-SEM works more efficiently with smaller sample sizes. It achieves high levels of statistical power with small sample sizes and does not have identification issues.[32] Lastly, the method is robust with handling missing values if the missing values are below a reasonable level.[33] Per Hair et al., this study uses 5% or less values missing per indicator as a reasonable limit.[34] The mean value treatment option is used to handle missing values.

This research project tests for interaction between factors. A two-stage approach is used to estimate the moderating effect between factors which the preferred method when testing moderating effects in formative models.[35]

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[30] Tim Coltman et al., "Formative Versus Reflective Measurement Models: Two Applications of Formative Measurement," *Journal of Business Research* 61 (2008): 1252.

[31] Joseph F. Hair et al., *A Primer on Partial Least Squares Structural Equations Modeling (Pls-Sem)*, ed. Joseph F. Hair (Los Angeles: Los Angeles : SAGE, 2014), 14.

[32] Ibid., 16-17.

[33] Jörg Henseler, Christian Ringle, and Marko Sarstedt, "Using Partial Least Squares Path Modeling in Advertising Research: Basic Concepts and Recent Issues," in *Handbook of Research on International Advertising*, ed. Shintaro Okazaki (Cheltenham, Gloucestershire: Cheltenham, Gloucestershire : Edward Elgar Publishing, 2012), 262.

[34] Hair et al., 51.

[35] Jorg Henseler and Georg Fassott, "Testing Moderating Effects in Pls Path Models: An Illustration of Available Procedures " in *Handbook of Partial Least Squares : Concepts, Methods and Applications*, ed. Vincenzo Esposito Vinzi, et al. (Berlin: Springer, 2010), 724.

PROPOSED MODEL AND HYPOTHESES

A review of the literature identified the variables and theoretical linkage among variables which were used in the proposed model Table 3A. Based on the literature, it is presumed that economic, political and environmental factors impact electronic waste import volume. It is hypothesized that each factor has a small, medium or large effect, respectively ≤ .10, ≈.30 or ≥ .50[36], on the dependent variable.

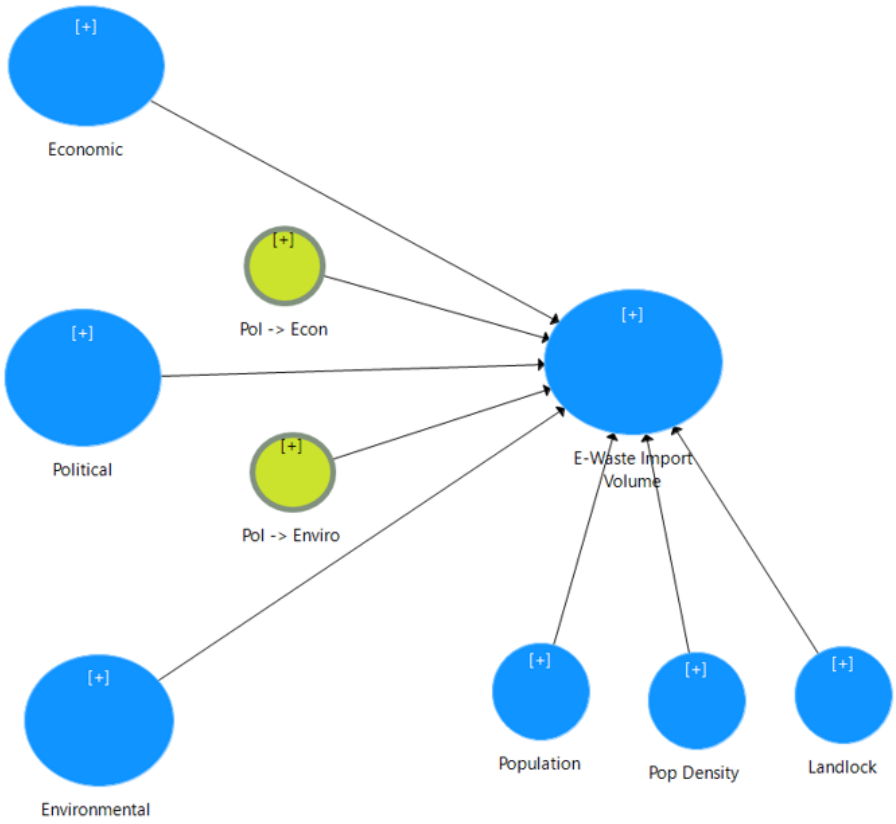

Fig. 3.1 Theoretical model and hypotheses represented as a nomological network

[36] Diana Suhr, "The Basics of Structural Equation Modeling," *University of North Colorado* (2006): 5.

From the theoretical framework, the study underscores five primary hypotheses:

H1a: The economic factor has a large positive effect on electronic waste import volume.

H2a: The political factor has a medium positive effect on electronic waste import volume.

H3a: The environmental factor has a small negative effect on electronic waste import volume.

H4a: The effect of the economic factor on electronic waste import volume depends on the political factor such that when the political factor is smaller, the effect of the economic factor is stronger.

H5a: The effect of the environmental factor on electronic waste import volume depends on the political factor such that when the political factor is larger, the effect of the environmental factor is stronger.

Development theory posits that less developed and developed countries' political economic systems are fundamentally different which lead to differences in their participation in the global economy.[37] Therefore this study includes alternative hypotheses related to a factor's effect on electronic waste volume within developed and developing countries.

H1b: Economic factor has a large positive effect on electronic waste import volume in developed countries.

H1c: Economic factor has a large positive effect on electronic waste import volume in developing countries.

H2b: The political factor has a medium positive effect on electronic waste import volume in developed countries.

H2c: The political factor has a medium positive effect on electronic waste import volume in developing countries.

[37] Gilpin, 307-11.

H3b: The environmental factor has a small negative effect on electronic waste import volume in developed countries.

H3c: The environmental factor has a small negative effect on electronic waste import volume in developing countries.

Hypotheses 1a-c identify the impact the economic factor has on electronic waste import volume. Tenets from the neoclassical economic growth perspective posit that countries trade goods it has a comparative advantage in. Arguably, more advanced countries have a comparative advantage to import waste because it has the capital needed to invest in machinery to maximize efficiency in mining e-waste. Contrarily, developing countries also have an economic comparative advantage to import waste. Disposal fees, labor costs and corporate taxes are often lower in developing countries which can promote a waste haven effect. Clapp asserts that waste importation interconnects with a country's economic position.[38] Empirical analysis of waste trade studies demonstrate that economic variables play a positive role in both developed and developing countries waste importation practices. Therefore, I expect that the economic factor will have a large positive effect on electronic waste import volume in both developed and developing countries.

Hypotheses 2a-c highlight the impact the political environment has on electronic waste import volume. The domestic institutional approach asserts that the domestic political structure is the primary factor that drives waste import volume because the domestic state determines trade and environmental policies that government and private actors are bound to. Following this logic, the political factor impacts import volume regardless of political structure differences between developed and developing countries. Therefore, I expect the political factor to have a

[38] Clapp, *Toxic Exports: The Transfer of Hazardous Wastes from Rich to Poor Countries*, 18.

medium positive effect on electronic waste import volume in both developed and developing countries.

Hypotheses 3a-c measure the impact of environmental policies on electronic waste import volume. The neoliberal international institutionalist approach argues that multilateral environmental treaties will help mitigate the negative environmental consequences of trade. Therefore, the more environmental treaties a country signs the more environmentally strict it is. Following this logic, it is expected that environmental agreements (a proxy for environmental stringency) will have a large effect on imported electronic waste volume. However, the number of environmental agreements a country participates in is not necessarily an indication of environmental stringency.[39] A country can ratify an agreement and not be complicit with its regulations. Empirical studies by de Zeeuw (2008, 2015), Kellenberg (2012, 2014), Lepawsky (2015), Lucier and Gareau (2015) and Khan (2016) illustrate that environmental treaties have been rather ineffective in governing waste trade. Consequently, it can be expected that the environmental factor will have a small negative effect on electronic waste import volume in both developed and developing countries.

Hypotheses 4a-5c measure the economic and environmental factors' relationship with electronic waste import volume when the political factor intervenes in the relationship. This assumption is based on the new growth theory and environmental political theory conjecture that the government (the political factor) influences the relationship between the economic and environmental factors and trade volume. When the political factor moderates on the relationship between the economy and electronic waste import volume, I expect the economic factor will have a positive and stronger effect on volume when the political factor is lower as compared to when the political factor is higher.

[39] Damania, Fredriksson, and List.

When the political factor moderates on the relationship between the environmental factor and electronic waste import volume, I expect the effect of the environmental factor will have a negative and stronger effect on volume when the political factor is larger as compared to when the political factor is smaller.

Table 3.1 Hypotheses with Expected and Actual Factor Effects

	Expected Effect Size		
Hypothesis	Combined	Developed	Developing
H1: Economic factor impact on electronic waste import volume	large/+	large/+	large/+
H2: Political factor impact on electronic waste import volume	medium/+	medium/+	medium/+
H3: Environmental factor impact on electronic waste import volume	small/ -	small/ -	small/ -
H4: The effect of the economic factor on electronic waste import volume depends on the political factor	+	+	+
H5: The effect of the environmental factor on electronic waste import volume depends on the political factor	-	-	-

small ≤ .10, medium ≈ .30, large ≥ .50 positive = (+) negative = (-)

OPERATIONALIZATION OF FACTORS AND VARIABLES

This study is comprised of 12 independent variables that load onto 3 independent exogenous (latent) factors, economic, political and environmental. The dependent variable (endogenous factor) is electronic waste import volume (Figure 3.2). A table outlining the operationalization of factors and variables is outlined in Table 5A.

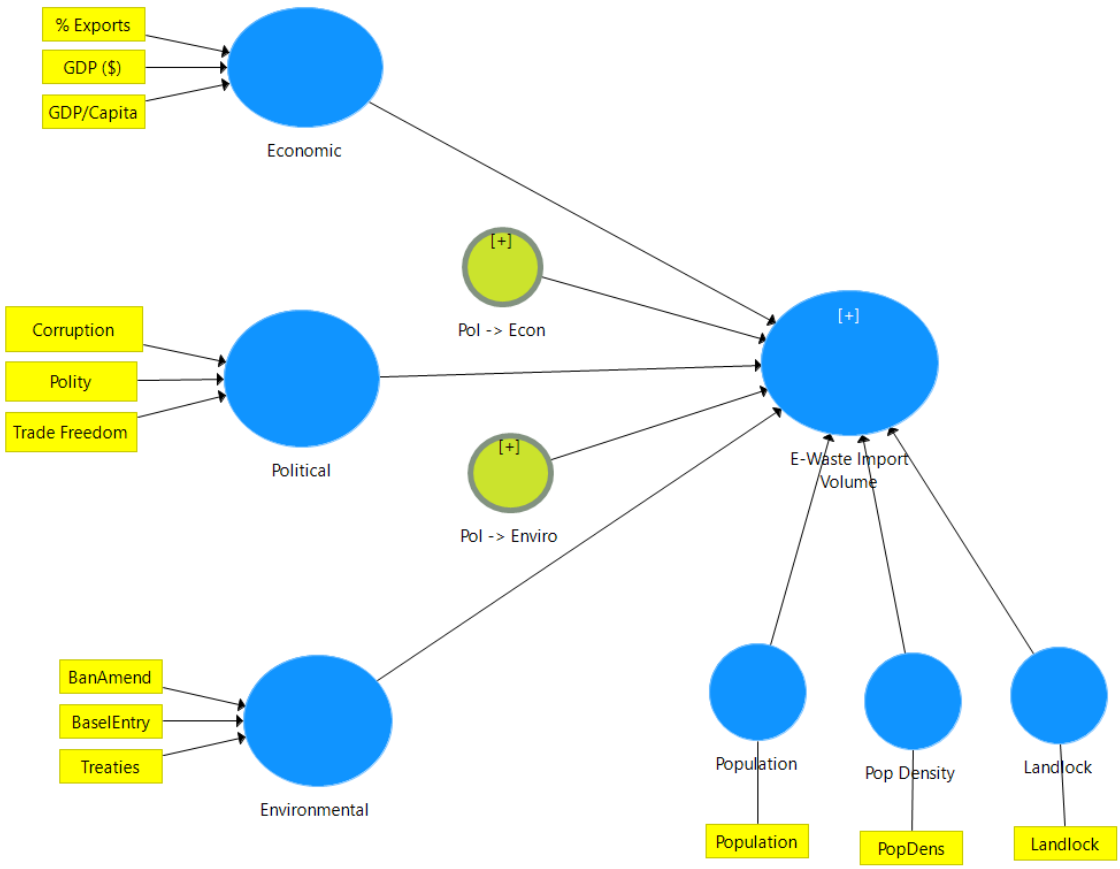

Fig. 3.2 Structural Equation Model

DEPENDENT VARIABLE

Electronic waste import volume (kilogram) is represented by the United Nations (UN) commodity code 854810. The commodity is defined as electrical machinery and equipment and parts thereof; including sound recorders and reproducers, televisions, and parts and accessories of such articles. It also consists of waste and scrap of primary cells, "primary batteries and electric accumulators; spent primary cells, spent primary batteries and spent electric accumulators."[40]

[40] United Nations.

INDEPENDENT VARIABLES

Economic Factor

An abundance of literature suggests that economic globalization induces waste trade. The economic determinants used in this study are gross domestic product (*GDP),* gross domestic product per capita (GDP/capita), percent of exported goods and services and total tax rate. This study asserts that the status of economic development of a nation is largely determined by these variables. Consequently, they provide insight as to whether the economic factor impacts e-waste import volume.

GDP is the value of goods and services produced plus taxes and minus subsidies not included in the value of the products.[41] GDP measures the scale (size) of a country's economy. The literature indicates that economy size plays a significant role in waste importation. Larger economies are more likely to be capital abundant (rich countries). These countries are able to procure machinery needed to optimize mineral extraction. Contrarily, poorer countries are likely to import waste as a means to increase state revenue and create a sustainable industry. Although, the manner in which GDP impacts the economic factor difffers between the economy types it is a key component of the economy. Therefore, the expected sign of the estimated coefficient for GDP on the economic factor is positive in both developed and developing countries.

Similarly, GDP/capita, a measure of the overall wealth of a country, is equally important when assessing economic development. GDP per capita is gross domestic product divided by midyear population. Some studies operationalize GDP/capita is as a proxy for environmental stringency.[42] These scholars contend that as citizens' incomes increase they become more

[41] The World Bank, "World Development Indicators " Accessed June 2016, http://databank.worldbank.org/data/home.aspx.

[42] Derek K. Kellenberg, "An Empirical Investigation of the Pollution Haven Effect with Strategic Environment and Trade Policy," *Journal of International Economics* 78 (2009). Baggs; Higashida and Managi.

environmentally conscious. In turn, environmental regulations become stricter. It is important to note that this causal relationship is more likely to occur in developed countries as opposed to developing countries because the individual income gain in a developing countries is less likely to be large enough (and widely distributed among citizens) to impact environmental regulations. Despite this, GDP/capita is still critical to the economic factor in developing countries. GDP/capita in developing countries is substantially lower than developed countries. A low GDP/capita can motivate countries to import waste to create employment opportunties and increase citizens' income. Although GDP/capita functions differently in the country types, the expected sign of the estimated coefficient for GDP/capita is positive in developed and developing countries. Equally, I do not expect the level of importance to differ substantially between the country types.

The percent of exported goods and services represents the value of all goods and other market services provided to the rest of the world. Although developed countries tend to have larger economies with a greater share of world trade the extent to which a country can participate in the global economy impacts its economic status . It is expected that the coefficient for percent of exported goods and services is positive on the economic factor in developed and developing countries.

Total tax rate measures the amount of taxes and mandatory contributions payable by a business in the second year of operation, expressed as a share of commercial profit.[43] The tax rate impacts the number of business operating in the region. Some sholars contend that developing countries tend to have lower tax rates in an attempt to attract foreign direct investment. The lower tax rate is perceived as being advantageous to the nation's economic status. Contrarily, the tax rate of operating a business in developed countries is higher which can adversely impact the economic health of the nation. These differences might yield different effect sizes of tax rate on the economic factor between the country types. However, because

[43] World Economic Forum, "The Global Competitiveness Report " Accessed June 2016, https://www.weforum.org/reports.

business taxes are a significant component to assessing the overall health of a national economy the total tax rate will have a positive effect on the economic factor in both developed and developing countries.

Political Factor

Studies suggest that an interconnection between regulatory policies, corruption levels, and government type impacts economic growth.[44] Therefore, the political factor encompasses, perceived level of corruption, government type, measures of innovation policies and policies related to the freedom to trade.

The Polity Index, measures the extent to which a government is authoritarian versus democratic. *Polity data is sourced from the Polity IV Project Index.* The polity score ranges from -10 to +10. A score closer to -10 represents a completely authoritarian government and a score +10 indicates a completely democratic nation.[45] Government type is critical to the political factor because it influences the policy making process, the type of policies constructed and its overall compliance to the policies. It is expected that polity will have a positive effect on the political factor in both developed and developing countries.

This study includes a corruption score which measures the level of perceived governmental corruption. Corruption data is retrieved from the Corruption Perceptions Index. The scale ranges from 0–100, a score closer to 100 is most favorable and indicates little perceived corruption.[46] Corruption impacts the stringency of regulatory policies created as well

[44] A. Cooper Drury, Jonathan Krieckhaus, and Michael Lusztig, "Corruption, Democracy, and Economic Growth," *International Political Science Review* 27, no. 2 (2006).

[45] Center for Systemic Peace, "Polity Iv Project, Political Regime Characteristics and Transitions," Accessed June 2016, http://www.systemicpeace.org/inscrdata.html.

[46] Transparency International, "Corruption Perceptions Index," Accessed June 2016, https://www.transparency.org/research/cpi/overview.

[168] The Heritage Foundation, "Index of Economic Freedom " Accessed June 2016, http://www.heritage.org/index/explore.

as influences the extent to which rules and regulations are adhered to. Recall that high level corruption, bribes that impact legislation, can occur in both developed and less developed countries. Therefore, it is expected that corruption will have a positive effect on the political factor in both country types. However, I expect the effect size of corruption to be substantially different in developed versus developing countries. I attribute this to the differences in the overall perceived level of corruption in both country types. Developed countries are generally viewed as having less corruption than developing countries in large part because lower level corruption such as bribes for permits tend to be absent. Whereas, in some developing countries bribes can be considered a 'normal cost of doing business'.

This study uses the Index of Economic Freedom rating of freedom to trade. The index quantifies the extent of tariff and non-tariff barrier policies that affect imports and exports of goods and services. The scale ranges from 0-100 in which a score closer to 100 represents the most freedom to trade.[47] A nation's ability to freely trade is reflective of its political economic policies. It is expected that the estimated coefficient for freedom to trade will have a positive effect on the political factor in both developed and developing countries. A popular assumption is that democratic states tend to be more open to trade. Building on this logic, I expect the effect size of the freedom to trade to differ substantially between developed and developing countries.

Innovation policies affect the cost of waste management. The study includes the innovation score from the Global Competitive Index that measures the extent to which policies promote research and development. The scale ranges from 0-100 with scores closer to 100 representing a stronger existence of policies that support research and development. The importance of innovation policies "is no longer the prerogative of high-income countries alone."[48] Therefore, it is expected that the coefficient for innovation will be positive on the political factor

[48] Cornell University, v.

in both developed and developing countries. However, the size of the impact should vary between country types. I expect innovation to have a higher impact on the political factor in developed countries compared to developing countries.

Environmental Factor

One of the most significant issues to emerge in the global political economy is the effect of trade on the environment. States and institutions, such as the WTO, created international environmental treaties and inserted environmental standards and protocols in global trade agreements. The European Commission created robust regulations to ensure international waste trade "is managed in an environmentally sustainable way, and prevents shipments from affecting human health."[49] The North American Free Trade Agreement (NAFTA) includes standards that promote environmentally sustainable development. This study conjectures that environmental regulation at the domestic and international levels impact waste trade and thus should be included waste trade studies. This research encompasses the number of environmental treaties a state has ratified, its environmental protection score and its ratification of the Basel convention and Basel Ban Amendment.

The number of environmental treaties is accessed from the Socioeconomic Data and Application Center dataset. They represent the absolute number of multilateral environmental treaties a country has agreed to. It is expected that the estimated coefficient for environmental treaties will be positive on the environmental factor for both developed and developing countries.

Environmental regulatory stringency plays a crucial role in state behavior in hazardous waste trade. This study uses the environmental protection index (EPI) score as proxy to

[49] European Commission, "Waste Shipment," Accessed March 2017, http://ec.europa.eu/trade/import-and-export-rules/export-from-eu/waste-shipment/.

measuring regulatory stringency.[50] Proponents of the race to the bottom theory and pollution haven hypothesis contend that lax environmental regulations in developing countries induce them to import hazardous waste. Empirical results from Kellenberg's (2009) study supports this theory.[51] However, descriptive data illustrates that developed nations import the majority of electronic waste. Because developed nations tend to have stricter environmental laws compared to developing nation, yet still import waste I surmise that environmental regulations will have a positive effect on the environmental factor in both developing and developed countries.

The Basel Convention and the Basel Amendment are key variables of the environmental factor. The focus of the treaties is to safeguard developing countries from importing hazardous waste from developed countries. Ratification and/or acceptance of the treaties are sourced from the Basel Convention database. The countries are coded dichotomously as either ratified the agreement or not (1= ratify 0=not ratify). The provisions do not limit developing countries from importing hazardous waste from other developing countries. In addition, in 2008 the Basel Convention shifted its perspective of e-waste from trash to treasure. Therefore, I expect that the two initiatives will have a negative effect on the environmental factor in developing countries. A developed countries willingness to ratify the Basel Convention and Ban Amendment treaty is an indication of its commitment to environmentally sound trading practice. However, the treaties do not address importing by developed nations. Therefore, I expect the treaties to have a negative effect on the environmental factor in developed countries.

[50] Baggs (2009) and Kellenberg (2012) mention that an environmental regulatory index does not exist. Green Growth (2015) suggests that the environmental sustainability index/environmental protection index score can be used as a proxy for environmental regulatory stringency.

[51] Kellenberg.

Table 3.2 Expected Outer Weights

		Expected Outer Weights		
Factor	Variable	Combined	Developed	Developing
ECONOMIC	GDP	+	+	+
	GDP /capita (US $)	+	+	+
	Export of Goods and Services	+	+	+
POLITICAL	Polity	+	+	+
	Corruption	+	+	+
	Freedom to Trade	+	+	+
ENVIRONMENT	Environmental Treaties	+	+	+
	Basel Convention	-	-	-
	Basel Ban Amendment	-	-	-

CONTROL VARIABLES

This study includes if a country is landlocked, population and population density as measures of control. The data is sourced from the World Bank and the Yale Center for Environmental Law and Policy. I expect that population and population density are likely to have a negative small impact on electronic waste import volume because some developing countries, particularly those in Africa and Asia, import waste despite being densely populated. Population density is also less likely to impact waste disposal in advanced countries because these countries generally have stricter environmental regulations prohibiting disposal in densely populated areas.

A country's proximity to a coast is also considered to influence waste import volume. Landlocked countries tend to experience higher transportation costs while countries with at least one coastal border are likely to have lower transportation fees. In reviewing e-waste trade data,

the largest importers of electronic waste are coastal countries. Therefore, landlocked variable will have a medium positive effect on electronic waste import volume.

DATA COLLECTION

This study evaluates economic, political and environmental factors' impact on electronic waste import volume of 130 countries, 36 developed and 94 developing from 1998-2014.[52] 757 country-years are assessed, 286 developed countries and 471 less developed countries. The number of countries reporting importing electronic waste varies by year. Table 7A displays the sample size by year. In 1998 approximately 60 countries reported importing electronic waste. By 2014, the number of importers increased 61%.

Data used in this research is compiled from multiple sources. A table outlining the source of the variables is outlined in Table 5A. Acquiring data for each variable for the desired period among the many different datasets proved challenging. The Environmental Protection Index is evaluated every two years whereas other index studies are conducted every year. Also, the timeframe of availability of data between the sources vary. Availability of economic country level data is available beginning in the 1960s. However, innovation policy analysis is a recent phenomenon and data is available beginning in 2006.

Inconsistent data and data integrity are concerning when analyzing waste trade both over time and within one year. Some nations record the value of imported waste without the volume and vice versa. This leads to missing values which impacts the sample size. In turn, a researcher's ability to accurately assess electronic waste trade is hindered. Additionally, some countries data is questionable. For example, from 1996 to 2012 China reported importing an average of 444, 289 kg per year of electronic waste. However, it has not reported receiving volume since 2012. It is unlikely that China has stopped importing electronic waste. More so, it

[52] The list of countries used in the study is outlined in table 6A.

is reasonable to assume that the country is either no longer reporting inbound shipments of electronic waste or is using alternative commodity codes (i.e. copper waste and scrap- 740400, nickel waste and scrap-750300 or aluminum waste and scrap- 760200).

LIMITATIONS

This research strays from other waste trade studies by not employing traditional ordinary least squares (OLS). OLS measures independent variables' direct effect on a dependent variable. In contrast, PLS-SEM measures the direct effect of a factor on the dependent variable. Consequently, this study does not evaluate the effect independent variables have on electronic waste import volume.

Another limitation of the study is that in using formative modeling my model does not account for outside variables that also might impact the factor. This is because formative modeling assumes perfect measurement between the independent variable and the factor. Therefore, my model only considers the variables in the model impact on the factor. Despite this, my study includes the variables that literature indicates are most critical. Table 3A outlines relevant literature associated with each variable.

Along similar lines, variables that do not align on the political, economic and environmental factors are not considered. For example, studies seeking to provide insight to the relationship between trading partners (testing the pollution haven hypothesis or race to the bottom theory) tend to use the gravity model which takes considers distance and borders. These variables are omitted from my study because I am not exploring trade patterns nor evaluating characteristics relative to trading partners.

Other studies incorporate a country's membership in free trade agreements to test the effect size trade agreements have on waste import volume. In lieu of this, I use the freedom to trade variable as a proxy for the absolute number of trade agreements. It is reasonable to

assume that the more trade freedom a country has the more likely it is to have a higher number of trade agreements.

Disposal capacity is considered a determinant a state evaluates when evaluating whether to import waste. Some studies use the number of landfills as a proxy for disposal capacity. This study does not include this measure because I believe it is not a suitable measure for disposal capacity and it does not directly impact a country's import volume. First, using the number of landfills is problematic because it assumes that waste will be disposed of in landfills. Electronic waste can also be incinerated. Additionally, not all electronic waste will be discarded in a disposal facility (landfill nor incinerator). Electronic waste can be recycled for valuable components, repurposed and then re-exported. Therefore, the number of disposal facilities can be irrelevant because the importing country might not be the final destination of the waste.

Furthermore, utilizing the number of facilities (landfills or incinerators) as a proxy for available capacity is flawed because it is not an adequate representation of available disposal capacity. A country can have many facilities with minimal available capacity. Alternatively, a country can have fewer disposal facilities with a large amount of disposal capacity. Considering capacity can be irrelevant all together in examining what influences states to import waste. Nations can decide to import waste despite knowing existing inefficiencies and inadequacies in waste management. They choose to improperly manage and dispose of electronic waste. This is evidenced by countries such as India, Bangladesh and Nigeria that are 'known' for lax waste disposal practices.

Additionally, capacity challenges have not stopped developed countries from importing electronic waste. OECD countries are experiencing capacity challenges as they are not able to construct new facilities due to social and economic constraints.[53] The United States Trade

[53] O'Neill, *Waste Trading among Rich Nations: Building a New Theory of Environmental Regulation*, 188.

Commission echoes this sentiment in that it conjectures that high capital costs of landfills may affect the ability to provide waste management services.[54] Nonetheless, advanced countries continue to import waste. Therefore, it is not necessary to consider the number of operating facilities in the study.

Components of the cost benefit analysis, such as disposal fees, local taxes and employee wages, are not included in the study. I recognize that these variables are key components of a cost-benefit analysis and that it is reasonable to consider profitability as a key driver to import waste. However, I contend that taxes and wages these variables are operational expenses that impact profitability at a granular level and therefore are better suited for studies that seek to explore the cost-benefit of importing waste at the micro (city) and meso (state) levels. Therefore, because this study focuses on determinants at the international level, these variables are omitted.

Baggs (2009) explains that "the use of available average or aggregate tariffs by country as proxies for tariffs specifically for hazardous waste is conceptually difficult since imported hazardous waste is often of *negative* value, making an ad valorem import tariff of dubious applicability."[55] This study uses the total tax rate and freedom to trade score per country in lieu of tariffs for hazardous and or recyclable waste at the local level. The total tax rate illustrates the rate a company pays in taxes to the state. The freedom to trade score considers trade barriers such as tariff rates.

Clapp (2001) contends that international debt is a key driver for states to import waste.[56] Lepawsky and McNabb (2010) examined the association between each country's net trade balance, debt service ratio and public debt as a percentage of GDP. Their findings illustrated that no significant relationship exists between net trade balance and debt service ratio nor

[54] United States International Trade Commission, xv.

[55] Baggs, 8.

[56] Clapp, *Toxic Exports: The Transfer of Hazardous Wastes from Rich to Poor Countries*, 11.

between net trade balance and public debt as a percentage of GDP. Therefore, central government debt is not included in the study. Additionally, in reviewing data approximately 67% of observations reported having no central government debt.[57]

It is important to note that although the variables in the political factor do not mirror the structure outlined in O'Neill's domestic institutional approach, I include variables that relate to tenets in her framework. For example, the EPI score, a proxy for environmental regulatory stringency, corresponds to the extent of regulatory stringency outlined in the regulatory structure in the domestic institutional approach.

[57] Statistic calculated from World Bank data 1998-2014.

CHAPTER 4

RESULTS – OVERALL MODEL: NOT A LOAD OF RUBBISH

This chapter seeks to analyze the impact the economic, political and environmental factors have on electronic waste import volume. The analysis evaluates three models; the combined model includes both developed and developing countries, the developed model focuses on developed nations and the developing model assesses developing nations. To have a robust analysis, panel data spanning years 1998 to 2014 was evaluated. 757 country-years are in in the combined model, 286 in the developed model and 471 in the developing model. Each model consists of 3 constructs with 9 independent variables.[1] Because data for all the variables is not available until approximately 2002, this model does not include innovation environmental protection index scores and tax rates data.[2] Tables 4.1and 4.2 outline the indicators' descriptive statistics and correlation values.

Table 4.1 Descriptive Statistics

Indicator	Mean	Median	Min	Max	Standard Deviation
Volume (tons)	8,544.23	73.02	0.00	566,820.61	35,831.25
GDP (USD millions)	511,802.55	81,026.30	349.46	17,393,103.00	1,613,808.38
GDP/capita	15,825.49	6,524.86	111.53	116,612.88	19,563.90
% Exports	50.97	37.84	0.00	3,264.50	128.65
Polity	2.71	8.00	-99.00	10.00	17.52
Corruption	-0.27	4.10	-99.00	10.00	22.80
Trade Freedom	71.74	77.70	-99.00	95.00	24.21
Enviro Treaties	3.04	3.00	0.00	9.00	1.75
Basel Entry	0.93	1.00	0.00	1.00	0.26
Ban Amend	0.40	0.00	0.00	1.00	0.49
Population (millions)	50.44	10.96	0.09	1,295.29	154.01
Population Density	334.15	81.30	-99.00	21,595.35	1,640.74

[1] The term indicator will be used interchangeably with the term variable.

[2] These variables will be assessed in the post Basel shift model discussed in Chapter 5.

Table 4.2 Indicator Correlation

Indicator	GDP	GDP/ capita	% Exports	Polity	Corruption	Trade Freedom	Enviro Treaties	Basel Entry	Ban Amend	Population	Population Density	Landlock
GDP	1											
GDP/capita	0.303	1										
% Exports	-0.034	0.066	1									
Polity	0.109	0.03	-0.022	1								
Corruption	0.092	0.214	0.011	0.033	1							
Trade Freedom	0.109	0.277	0.022	0.152	0.318	1						
Enviro Treaties	-0.263	-0.378	-0.032	-0.128	-0.006	-0.031	1					
Basel Entry	-0.287	0.087	0.037	0.071	0.335	0.227	0.053	1				
Ban Amend	-0.012	0.349	0.007	0.169	0.17	0.209	-0.039	0.17	1			
Population	0.273	-0.094	-0.024	0.053	0.048	-0.144	-0.013	-0.017	-0.109	1		
PopDensity	-0.03	0.11	0.084	-0.084	-0.093	-0.369	-0.131	-0.074	-0.036	-0.022	1	
Landlock	-0.133	-0.042	-0.006	0.04	-0.049	-0.035	0.007	-0.125	0.005	-0.122	-0.072	1

COMBINED MODEL

MEASUREMENT MODEL ASSESSMENT

Collinearity

The variance inflation factor (VIF) was assessed to determine if collinearity issues exist. Table 4.3 reports the VIF values for all the indicators. All values are between .20 and 5, hence collinearity is not an issue.[3]

Table 4.3 Outer VIF - Combined Model

	VIF
% Exports	1.01
Ban Amend	1.03
Basel Entry	1.03
Corruption	1.11
Economic * Political	1.00
Environmental * Political	1.00
GDP ($)	1.10
GDP/Capita	1.11
Landlock	1.00
Polity	1.02
Population Density	1.00
Population	1.00
Trade Freedom	1.14
Treaties	1.01

[3] Hair, 143.

Significance and Relevance of the Indicators

The outer weight value expresses a variable's level of relative importance, or its relative contribution, to forming the factor. The higher the value, the more important the indicator is to the factor.[4] The significance of a variable, an indication of whether the variable significantly contributes to its corresponding construct, is determined by the p-value of the outer weight. An indicator is significant if its outer weight p-value is less than .05. An indicator is of absolute importance if the p-value of the outer weight is not significant, greater than .05, but its outer loading is above .50.[5]

Table 4.4 outlines the weight (importance) and significance of the indicators. The percent of exports of goods and services is the most relevant variable to the economic factor, .931. The gross domestic product indicator is of medium importance with .383. GDP/capita is the least important indicator to the economic factor, .031. Interestingly, none of the economic indicators are significant, they all have p-values higher than .05, to the economic factor. More so, only the percent of goods and services exported is important (it is not significant but its outer loading is higher than .50).

Polity, the extent to which a government is democratic, is the most important indicator to the political factor, outer weight .67. The freedom to trade is of medium importance with outer weight of .417. Corruption is the least important indicator to the political factor, .386. Notably, all political variables are statistically significant to the factor.

The number of environmental treaties is the most critical indicator to the environmental factor with an outer weight of .936, and is significant. The Ban Amendment is of medium importance with an outer weight of .354. However, it is not significant nor is it of absolute importance to the factor. Although, the ratification of the Basel Convention is the least important indicator, -.300, it is significant.

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[4] Ibid., 146.
[5] Absolute importance is the information an indicator provides without considering the other indicators. Ibid., 148.

Table 4.4 Variable Results - Combined Model

Factor	Variable	Outer Weights (Outer Loadings)	t Value	p Value	Significance p value < .05
ECONOMIC	GDP	.383 (.36)	1.54	0.12	No
	GDP /capita (US $)	.031 (.21)	0.18	0.86	No
	% Export Goods and Services	.931 (.92)	1.88	0.06	No
POLITICAL	Polity	0.67 (.79)	12.49	0.00	Yes
	Corruption	0.386 (.49)	5.08	0.00	Yes
	Freedom to Trade	0.417 (.75)	3.64	0.00	Yes
ENVIRONMENT	Environmental Treaties	0.936 (.91)	9.19	0.00	Yes
	Basel Convention	-0.300 (-.19)	2.62	0.01	Yes
	Basel Ban Amendment	0.354 (.27)	1.62	0.11	No

STRUCTURAL PATH MODEL ASSESSMENT (Test of Hypotheses)

Collinearity

The variance inflation factor (VIF) was assessed to determine if collinearity issues exist. Table 4.5 reports the VIF values for all the factors.[6] All values are between .20 and 5, hence collinearity is not an issue.[7]

Table 4.5 Inner VIF - Combined Model

	VIF
Economic	1.96
Environmental	1.08
Landlock	1.03
Pol -> Econ	2.02
Pol -> Enviro	1.27
Political	1.18
Population Density	1.37
Population	1.03

Assessment of path coefficients[8]

Table 4.6 reports the standardized values and significance of the path coefficients. Estimated coefficients closer to +1 represent strong positive relationship.[9] The economic factor has a medium sized effect on electronic waste import volume and is statistically significant. A one-unit change in the economic factor increases waste importation .39 standard deviations, 13,795 tons[10], when all other factors are held constant.

[6] The terms factor and construct will be used interchangeably.

[7] Hair, 143.

[8] A robustness check was conducted with Mexico and South Korea as outliers. When dummy variables for Mexico and South Koreas are set as control variables the results are similar. This illustrates that Mexico and South Korea's volume do not alter the factors' effect on electronic waste import volume.

[9] Hair, 195.

[10] Table 8A displays the calculated estimated weight change for each model. Weight is calculated by multiplying the standard deviation of the import volume by the factor's path coefficient.

The political factor's effect on import volume is miniscule. When the political factor changes by one-unit, electronic waste importation rises .062 standard deviations, 2,293 tons, when all other factors are held constant.

The environmental factor is significant but also has virtually no effect on import volume.[11] A one-unit change in the environmental factor decreases electronic waste importation .075 standard deviations, 2,616 tons, when all other factors are held constant.

Table 4.6 Structural Path Results - Combined Model

Paths	Path Coefficients	t Value	p Value	Significance p value < .05
Economic --> Import Volume	0.39	2.26	0.02	Yes
Political Economy --> Import Volume	0.05	0.37	0.71	No
Political --> Import Volume	0.06	2.19	0.03	Yes
Political Environment --> Import Volume	-.012	0.55	0.58	No
Environment --> Import Volume	-.073	3.59	0.00	Yes

small ≤ .10, medium ≈ .30, large ≥ .50 positive = (+) negative = (-)

[11] Path coefficients may be significant but their effect size can be small. This usually occurs with large sample sizes. Hair, 197.

The model tests for the economic and environmental factors' effect when the political factor moderates on the relationship between the factors and e-waste import volume. Figure 4.1 explains the effect size of the economic factor based on the value of the political factor. Regardless of the political factor's value, the political factor does not impact the relationship between the economic factor and electronic waste import volume (the slopes above, below and at the mean political values are the same). This is likely because combining country types obscures the effect as evidenced by richer effects when country types are modeled separately. Nevertheless, in all 3 cases, as the economic factor gets larger, import volume increases.

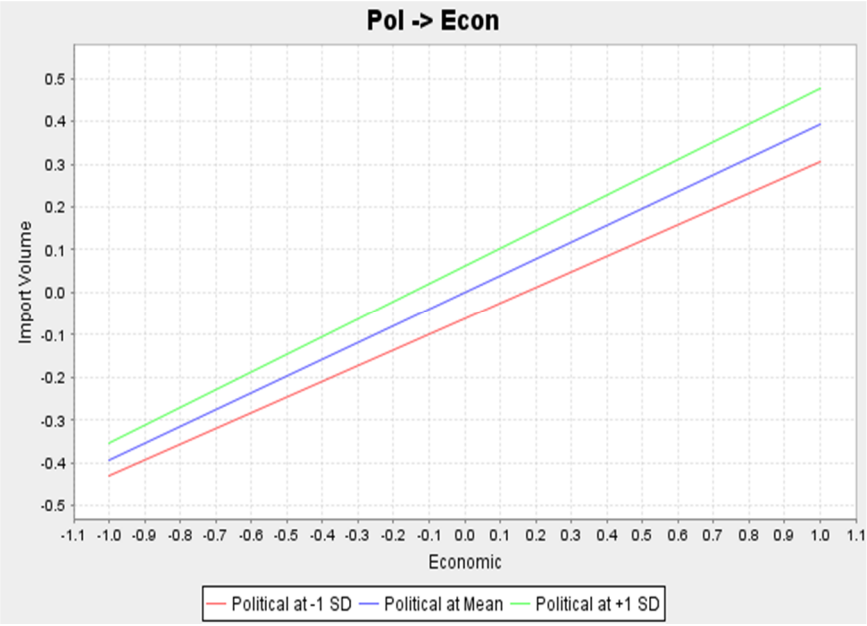

Fig. 4.1 Effect of Economic Factor Conditional on Value of Political Factor- Combined

Figure 4.2 explains the effect size of the environmental factor based on the value of the political factor. The estimates illustrate that the relationship between the environmental factor and volume is slightly stronger when the political factor's value is higher (a steeper slope when the political value is 1 standard deviation above the mean). Conversely, the environmental factor has a weaker effect on volume when the political factor values are smaller (a less steep slope when the political value is 1 standard deviation below the mean). In all 3 cases, as the environmental factor gets larger, e-waste import volume decreases.

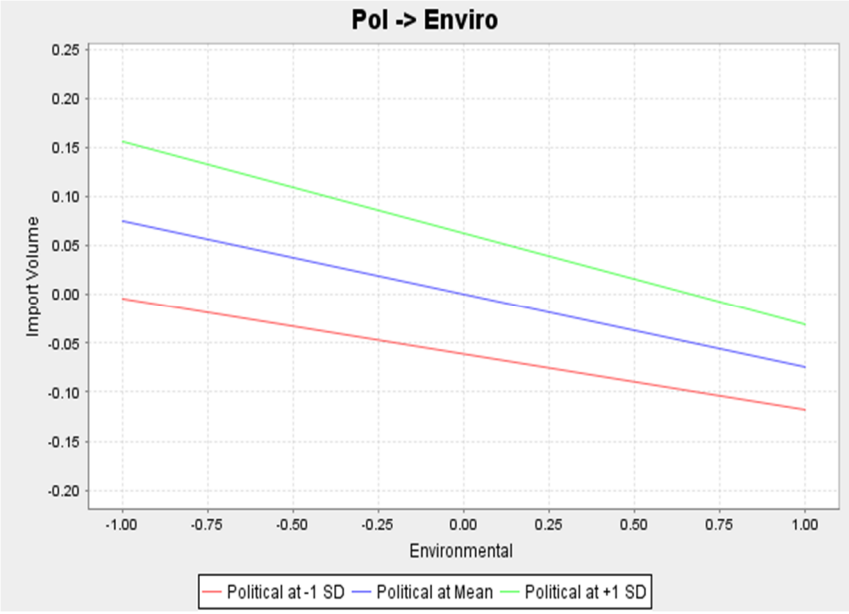

Fig. 4.2 Effect of Environmental Factor Conditional on Value of Political Factor- Combined

Assessment of R^2 (Coefficient of Determination)

The R^2 for the combined model is .189. Economic, political and environmental factors explain 19% of electronic waste importation volume when both developed and developing countries are evaluated in the same model.

Effect size of f^2

The effect size of the construct, f^2, was tested to determine whether a construct has a substantive impact on the endogenous factor if it is omitted from the model. f^2 values less than .02, .02, .15 and .35 respectively, represent no effect, small, medium or large effect on the dependent variable.[12] The economic factor will have nearly a medium sized effect on electronic waste import volume if excluded from the model. The absence of the other factors will have virtually no effect on volume.

Table 4.7 f^2 - Combined Model

	Import Volume
Economic	0.09
Environmental	0.01
Landlock	0.00
Pol -> Econ	0.00
Pol -> Enviro	0.00
Political	0.00
Population Density	0.00
Population	0.00

[12] Ibid., 201.

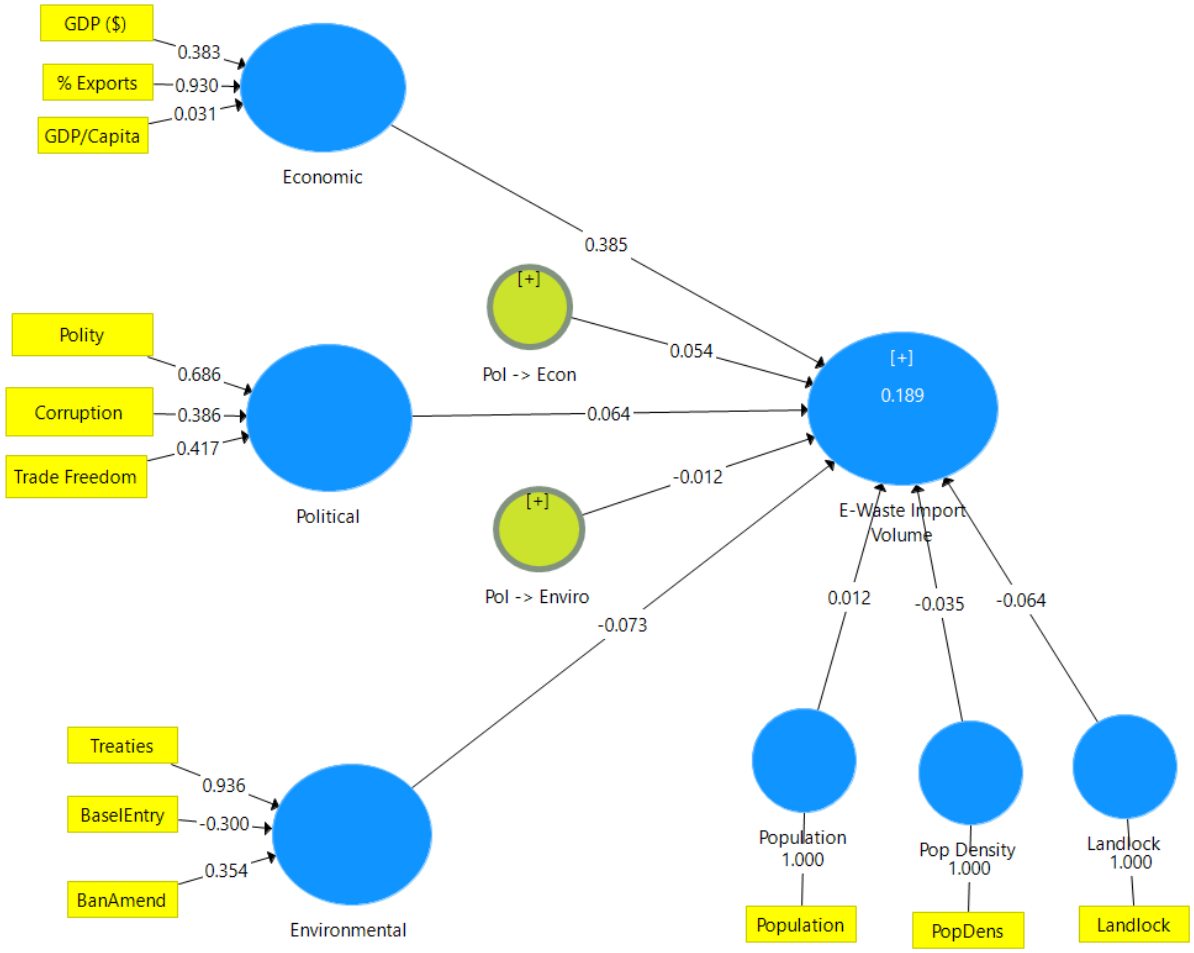

Fig. 4.3 Structural Equation Model - Combined Model

DEVELOPED MODEL

MEASUREMENT MODEL ASSESSMENT

Collinearity Issues

Table 4.8 reports the VIF values for all the indicators. All values are between .20 and 5, hence collinearity is not an issue.

Table 4.8 Outer VIF - Developed Model

	VIF
% Exports	1.18
Ban Amend	1.06
Basel Entry	1.12
Corruption	1.36
Economic * Political	1.00
Environmental * Political	1.00
GDP ($)	1.19
GDP/Capita	1.09
Landlock	1.00
Polity	1.00
Population Density	1.00
Population	1.00
Trade Freedom	1.36
Treaties	1.06

Significance and Relevance of the Indicators

Table 4.9 illustrates the significance and relevance of the indicators in the developed model. Gross domestic product (GDP) is the most important variable, .908 to the economic factor. GDP/capita and the amount of exports as a percent of GDP are relatively equally important with -.248 and -.218 values. None of the economic indicators are significant. However, GDP is of absolute importance (outer loading = .93).

Polity is the most critical indicator, .959, to the political factor and is the only significant indicator in the model. Corruption is of medium importance to the political factor, .352. Freedom to trade is the least influential in the political factor.

The Ban Amendment is the most pertinent indicator to the environmental factor, .686. Ratification of the Basel Treaty is nearly as important with a .517 indicator weight. Environmental treaties are the least essential indicator to the factor, .186. It is worth noting that none of the environmental variables are significant. However, the Ban Amendment and Basel Treaty are of absolute importance.

Table 4.9 Variable Results - Developed Model

Factor	Variable	Outer Weights (Outer Loadings)	t Value	p Value	Significance p value < .05
ECONOMIC	GDP	0.908 (.93)	1.33	0.18	No
	GDP /capita (US $)	-.248 (-.13)	0.80	0.42	No
	% Export Goods and Services	-.218 (-.55)	0.94	0.35	No
POLITICAL	Polity	.959 (.95)	3.08	0.00	Yes
	Corruption	.352 (.23)	0.78	0.43	No
	Freedom to Trade	-.254 (.03)	0.47	0.64	No
ENVIRONMENT	Environmental Treaties	.186 (.35)	0.56	0.58	No
	Basel Convention	.517 (.72)	1.48	0.14	No
	Basel Ban Amendment	.686 (.82)	1.36	0.18	No

STRUCTURAL PATH MODEL ASSESSMENT (Test of Hypotheses)

Collinearity

The variance inflation factor (VIF) was assessed to determine if collinearity issues among the factors exist. Table 4.10 reports the VIF values for all the factors. The economic and population factors exhibit collinearity. However, the economic construct is not deleted from the model because literature indicates that it is essential to evaluate waste trade. The collinearity issue is resolved when population is omitted from the model, the VIF value for the economic factor is 3.14. Nonetheless, because population is a control variable it is not necessary to exclude it from the model.

Table 4.10 Inner VIF - Developed Model

	VIF
Economic	10.12
Environmental	1.96
Landlock	1.14
Pol -> Econ	9.71
Pol -> Enviro	2.85
Political	12.20
Population Density	1.78
Population	10.20

Assessment of path coefficients[13]

Table 4.11 displays the factors' path coefficients, impact size, on electronic waste import volume. Notably, none of the factors are statistically significant. The economic factor's effect is between small and medium. When the economic factor increases by one unit, e-waste volume decreases .16 standard deviations, or -5,624 tons[14], holding all other factors constant.

The political and environmental factors have an inconsequential effect on import volume. When the political factor changes by one unit, e-waste volume decreases .06 standard deviations, 2,214 tons, when all other factors are held constant. A one-unit change in the environmental factor decreases waste importation .04 standard deviations, 1,336 tons, when all other factors are held constant.

Table 4.11 Structural Path Results- Developed Model

Paths	Path Coefficients	t Value	p Value	Significance p value < .05
Economic --> Import Volume	-.16	0.89	0.38	No
Political Economy --> Import Volume	-0.26	0.75	0.45	No
Political --> Import Volume	-.063	0.35	0.73	No
Political Environment --> Import Volume	-0.06	0.49	0.62	No
Environment --> Import Volume	-0.04	0.44	0.66	No

small ≤ .10, medium ≈ .30, large ≥ .50 positive = (+) negative = (-)

[13] A robustness check was conducted on import volume per capita as the dependent variable. The results are similar to the output in the study with the dependent variable as volume in tons.

[14] Table 8A displays the calculated estimated weight change for each model. Weight is calculated by multiplying the standard deviation of the import volume by the factor's path coefficient.

It is assumed that the political factor moderates the relationship between the economic and environmental factors and e-waste import volume. Figure 4.4 explains the effect size of the economic factor based on the value of the political factor. The estimates show that the relationship between the economic factor and volume is stronger when the political factor value is higher (a steeper slope when the political value is 1 standard deviation above the mean). Conversely, the economic factor has a weaker effect on volume when the political factor values are low (a less steep slope when the political value is 1 standard deviation below the mean). When the political value is high, as the economic factor gets larger volume decreases.[15] Alternatively, when the political factor is low as the economic factor gets larger volume increases.

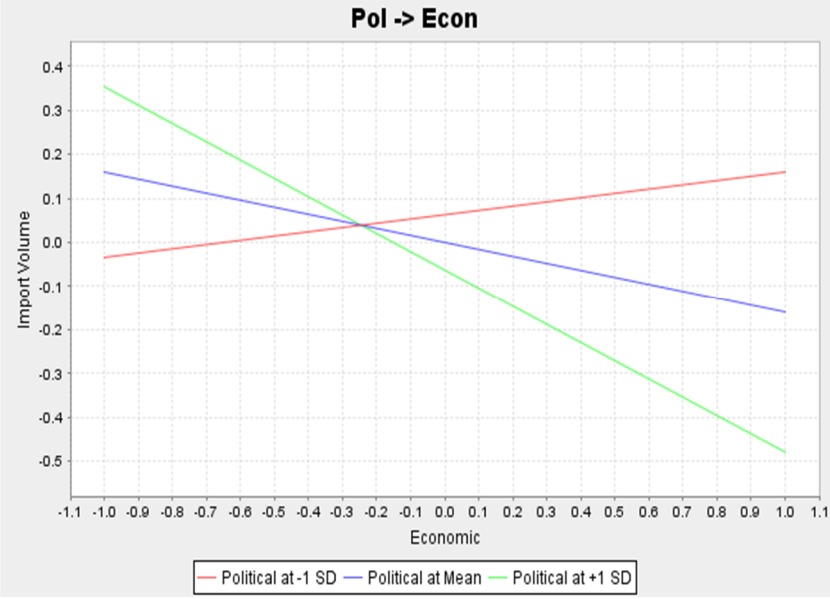

Fig. 4.4 Effect of Economic Factor Conditional on Value of Political Factor- Developed

[15] Downward slope of the line.

Figure 4.5 explains the effect size of the environmental factor based on the value of the political factor. The environmental factor's effect on volume is stronger when the value of the political factor is high (a steeper slope when the political value is 1 standard deviation above the mean). However, the value of the political factor changes the direction of the volume. When the political value is low, as the environmental factor gets larger, import e-waste volume increases. Alternatively, when the political factor is high, volume decreases as the environmental factor gets larger. This result suggests that countries with high political scores are likely to have political structures that reinforce environmental initiatives.

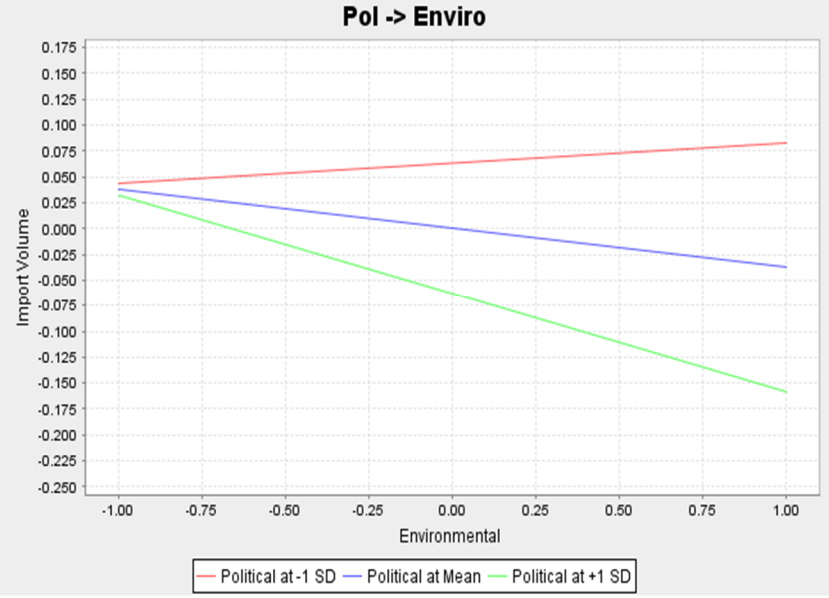

Fig. 4.5 Effect of Environmental Factor Conditional on Value of Political Factor- Developed

Assessment of R^2 (Coefficient of Determination)

The R^2 for the developed model is .044. Economic, political and environmental factors explain approximately 4% of electronic waste importation volume in developed countries.

Effect size of f^2

The effect size of each construct was tested to assess whether it has a substantive impact on the endogenous factor if it is omitted from the model. None of the factors will substantially affect electronic waste import volume if they are excluded from the model.

Table 4.12 f^2 - Developed Model

	Import Volume
Economic	0.00
Environmental	0.00
Landlock	0.01
Pol -> Econ	0.00
Pol -> Enviro	0.00
Political	0.00
Population Density	0.00
Population	0.01

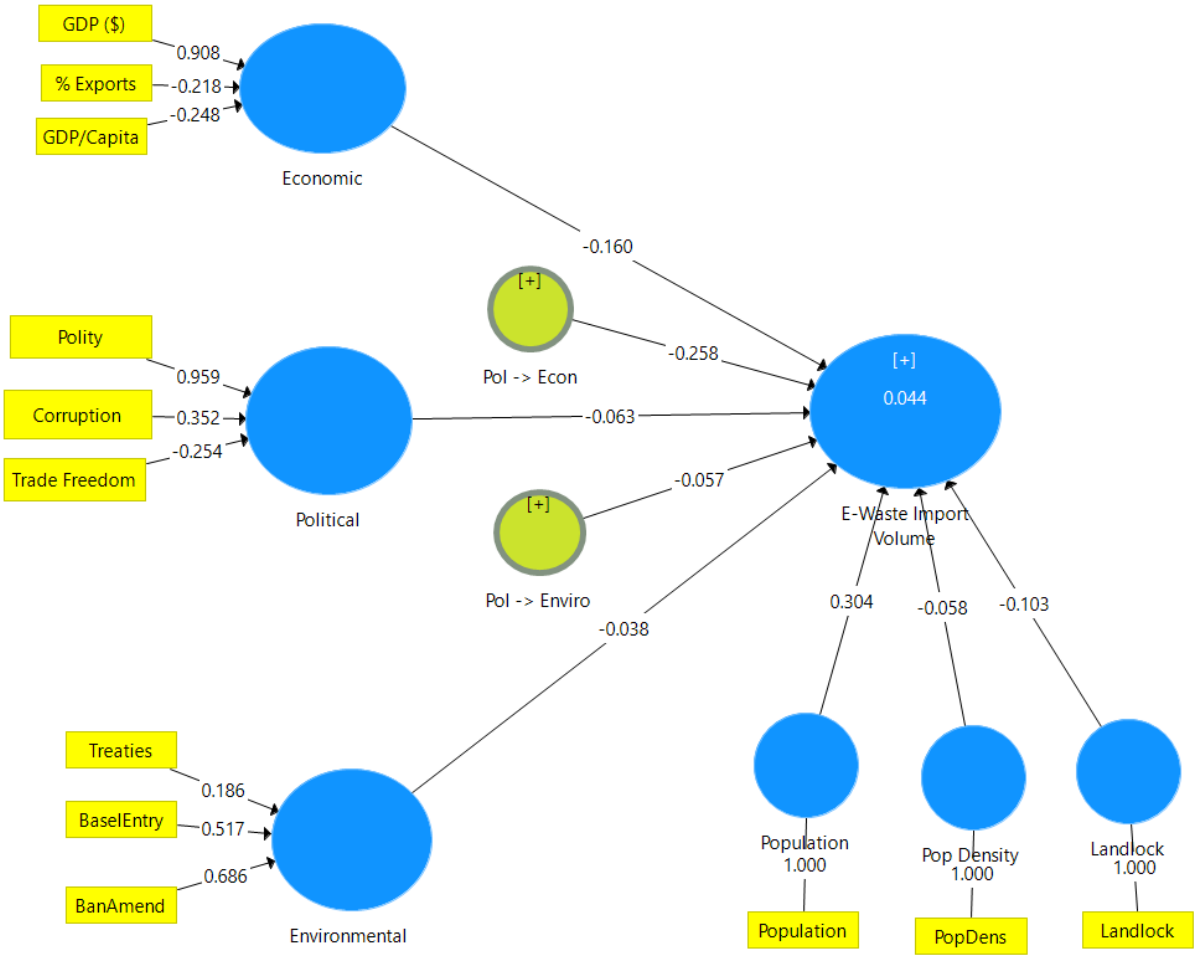

Fig. 4.6 Structural Equation Model - Developed Model

DEVELOPING MODEL

MEASUREMENT MODEL ASSESSMENT

Collinearity

The VIFs for the path coefficients are below 5, indicating that no collinearity issues among the indicators exist.

Table 4.13 Outer VIF - Developing Model

	VIF
% Exports	1.02
Ban Amend	1.02
Basel Entry	1.01
Corruption	1.06
Economic * Political	1.00
Environmental * Political	1.00
GDP ($)	1.03
GDP/Capita	1.02
Landlock	1.00
Polity	1.06
Population Density	1.00
Population	1.00
Trade Freedom	1.11
Treaties	1.01

Significance and Relevance of the Indicators

Table 4.14 outlines the significance and relevance of the indicators in the developing model. The percent of exports is the most critical indicator to the economic factor, .515. GDP is of medium importance, .479. GDP/capita is the least important variable, -.038. Interestingly, none of the economic indicators are significant. However, the percent of exports and GDP are of absolute importance to the economic factor.

Alternatively, all variables on the political factor are statistically significant. The freedom to trade is the most profound indicator, .839. Polity is of importance with an outer weight of .616. Corruption is of concern but is the least critical variable, .344.

The environmental indicators are all statistically significant to the environmental factor. The number of environmental treaties a country participates in is the most relevant indicator, .781. The Ban Amendment is also important, .512. Ratifying the Basel Treaty is the least important indicator -.359.

Table 4.14 Variable Results - Developing Model

Factor	Variable	Outer Weights (Outer Loadings)	t Value	p Value	Significance p value < .05
ECONOMIC	GDP	.479 (.57)	1.50	0.13	No
	GDP /capita (US $)	-.038 (.07)	1.01	0.32	No
	% Export Goods and Services	.515 (.73)	1.95	0.05	No
POLITICAL	Polity	.616 (.74)	5.57	0.00	Yes
	Corruption	.344 (.48)	3.10	0.00	Yes
	Freedom to Trade	.839 (.72)	2.82	0.01	Yes
ENVIRONMENT	Environmental Treaties	.781 (.81)	16.59	0.00	Yes
	Basel Convention	-.359 (-.28)	5.80	0.00	Yes
	Basel Ban Amendment	.512 (.53)	7.41	0.00	Yes

STRUCTURAL PATH MODEL ASSESSMENT (Test of Hypotheses)

Collinearity

The inner VIFs were assessed to determine if collinearity exists. Collinearity issues exist for the economic and political economic factor, the values are above 5. The collinearity issue is resolved when the political economic factor is excluded from the model, the economic VIF becomes 1.12

Table 4.15 Inner VIF - Developing Model

	VIF
Economic	5.95
Environmental	1.07
Landlock	1.08
Pol -> Econ	5.92
Pol -> Enviro	1.08
Political	1.81
Population Density	1.05
Population	1.63

Assessment of path coefficients[16]

Surprisingly, the economic factor has a small to medium effect on electronic waste import volume. Equally, unexpected is that the economic factor is not statistically significant. When the economic factor increases by one-unit, electronic waste import volume increases .17 standard deviations, 5,914 tons[17], holding all other factors constant.

The political factor has nearly a medium sized effect on volume. A one-unit change in the political factor increases volume .21 standard deviations, 7,562 tons. The environment has a small effect on electronic waste import volume and is statistically significant. When the

[16] A robustness check was conducted on import volume per capita as the dependent variable. The results are similar to the output in the study with the dependent variable as volume in tons.

[17] Table 8A displays the calculated estimated weight change for each model. Weight is calculated by multiplying the standard deviation of the import volume by the factor's path coefficient.

environmental factor increases one unit, waste importation decreases .09 standard deviations, 3,297 tons, holding all other factors constant.

Table 4.16 Structural Path Results - Developing Model

Paths	Path Coefficients	t Value	p Value	Significance p value < .05
Economic --> Import Volume	0.17	0.77	0.44	No
Political Economy --> Import Volume	0.90	2.26	0.02	Yes
Political --> Import Volume	0.21	1.98	0.05	Yes
Political Environment --> Import Volume	-.028	1.24	0.22	No
Environment --> Import Volume	-.092	3.65	0.00	Yes

small ≤ .10, medium ≈ .30, large ≥ .50 positive = (+) negative = (-)

The model evaluates the economic and environmental factors' effect on electronic waste volume under the assumption that the political factor impacts the relationship between the factors and e-waste volume. Figure 4.7 demonstrates the effect size of the economic factor based on the value of the political factor. The relationship between the economic factor and volume is equally strong when the political factor value is low and high (the slope of the line is steep when the political value is 1 standard deviation above and below the mean). However, the value of the political factor changes the direction of import volume (the slopes of the lines are opposite). When the political value is low, as the economic factor gets larger, volume decreases. This effect can possibly be attributed to less democratic nations (authoritarian regimes) that are not as open to trade and are not large participants in the global economy. Conversely, when the political factor value is high, as the economic factor gets larger, import volume increases.

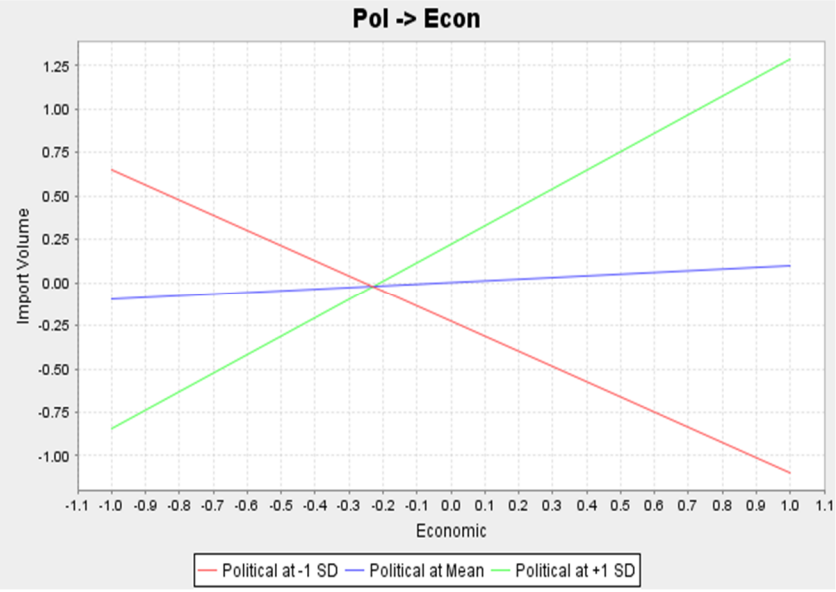

Fig. 4.7 Effect of Economic Factor Conditional on Value of Political Factor- Developing

Figure 4.8 demonstrates the effect size of the environmental factor based on the value of the political factor. The relationship between the environmental factor and volume is stronger when the value of the political factor is higher (a steeper slope when the political value is 1 standard deviation above the mean). Alternatively, the environmental factor has a weaker effect when the political factor is low (a less steep slope when the political value is 1 standard deviation below the mean).

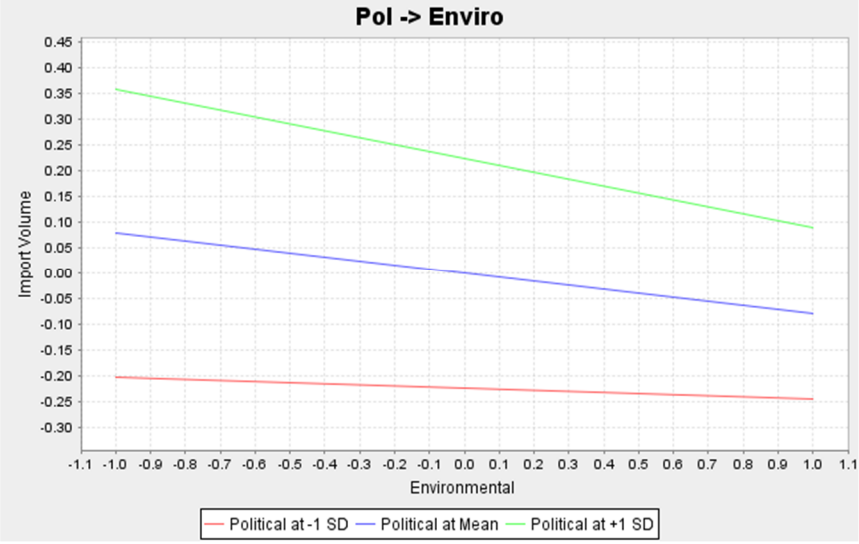

Fig. 4.8 Effect of Environmental Factor Conditional on Value of Political Factor- Developing

Assessment of R^2 (Coefficient of Determination)

The R^2 for the developing model is .384. Economic, political and environmental factors explain 38% of electronic waste importation volume in developing countries.

Effect size of f^2

The effect size of each construct was tested to assess whether it has a substantive impact on the endogenous factor if it is omitted from the model.[18] The political economy and the political factor will have a small effect on volume if they are deleted from the model. All other factors will have no effect on electronic waste import volume if absent from the model.

[18] f^2 values less than .02, .02, .15 and .35 respectively, represent no effect, small, medium or large effect on the dependent variable.

Table 4.17 f^2 - Developing Model

	Import Volume
Economic	0.01
Environmental	0.01
Landlock	0.00
Pol -> Econ	0.06
Pol -> Enviro	0.00
Political	0.04
Population Density	0.00
Population	0.00

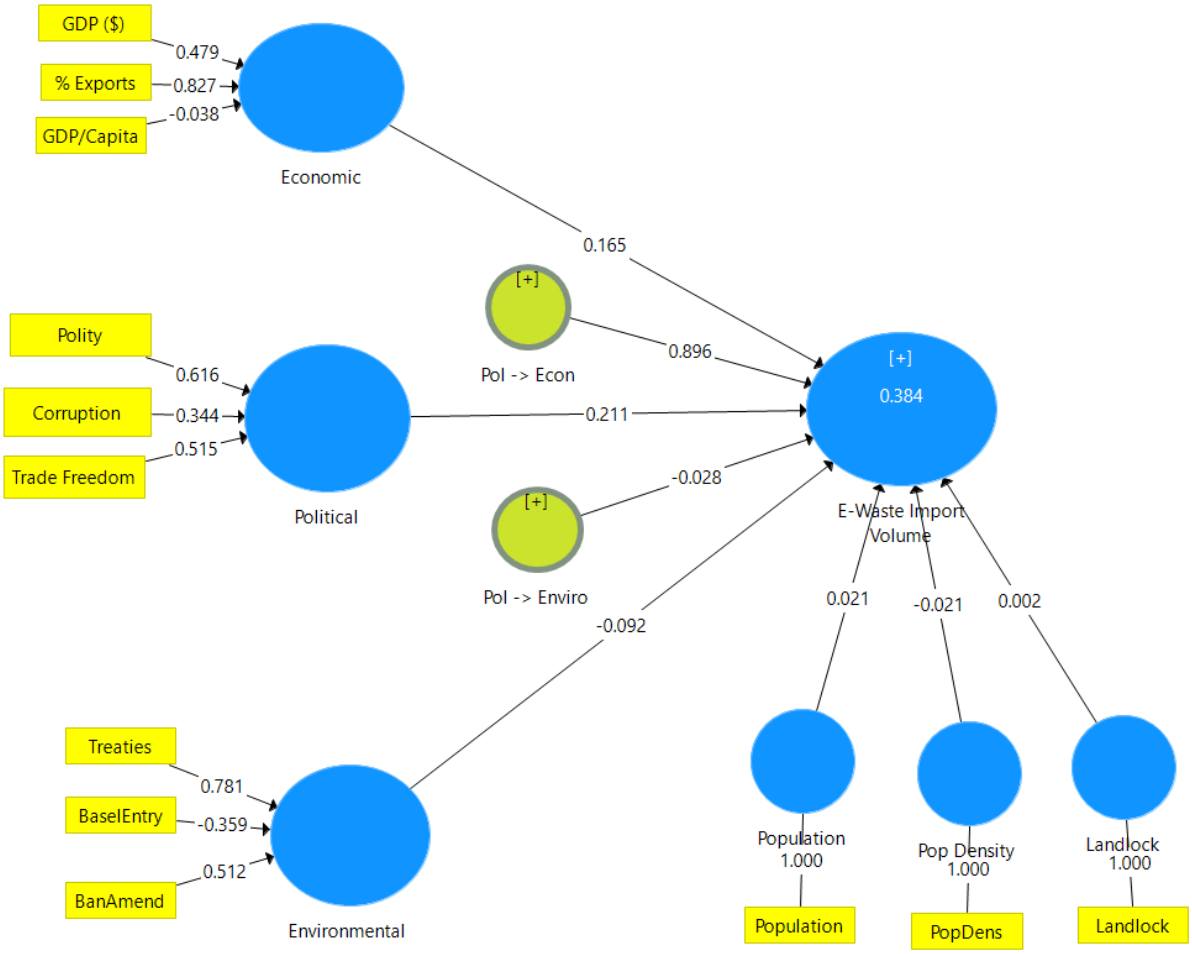

Fig. 4.9 Structural Equation Model - Developing Model

OVERALL FINDINGS AND THEORETICAL IMPLICATIONS

STRUCTURAL (FACTOR) ASSESSMENT

The economic, political and environmental factors better explain electronic waste import volume practices in developing countries, (38%) as compared to the combined model (19%) and developed countries (4%). Although developed and developing countries import volume are both best explained by the new endogenous growth theory which claims that the policies influence the economy and trade practices, the findings illustrate that economic, political and environmental factors behave differently in developed and developing countries. These varied results support tenets of development theory that contend that differences in the political economic structure between advanced and less advanced countries impact each nation's global trade practices and levels of development.[19]

Table 4.18 outlines the hypotheses, the factors' significance and expected/actual effect sizes. In all models, the study hypothesizes that the economic factor is the dominant driver in influencing waste importation. In doing so, it is suspected that the economic nationalist theory best explains waste motivates states to import hazardous electronic waste. The results indicate that the economic factor has the largest effect when country types are modeled jointly. However, the economic factor is not as powerful as literature suggests. It has a medium sized effect on volume in the combined model and a small to medium effect in developed and developing countries. Additionally, the economic factor's small increase on e-waste volume in developing states belie proponents of the pollution/waste haven hypothesis that contend a poor economic status drives a country to increase a substantial amount of waste.

The economic factor results also do not align with literature that claims capital abundance increases waste importation.[20] The economic factor decreases e-waste import

[19] Gilpin, 307-11.

[20] Discussed in Baggs (2009).

volume in developed countries. Notably, the economic factor is only significant when country types are modeled together.

It is expected that the political factor will have a medium effect and increase volume in all models. The political factor has a small effect on volume in both the combined and developed models. In developing countries, the political factor has a medium sized effect on e-waste import volume. The findings suggest that the domestic institutionalist theory is more applicable to developing countries as compared to developed countries. More so, the varied effect size of the political factor when country types are evaluated independently indicate that is better to assesses country types independently to determine whether the domestic institutionalist theory explains electronic waste import behavior.[21]

The purpose of environmental policies and initiatives is to decrease hazardous activities. Therefore, in all the models, it is hypothesized that the environmental factor slightly decreases e-waste import volume. This hypothesis is accurate in all the models. However, the impact is extremely small that the environmental factor has very little effect on e-waste import volume in all model types. This can be attributed to states signing environmental treaties but not complying with them.[22] This outcome provides limited support to liberal international institutionalist that conjecture international environmental agreements minimize hazardous waste trade.

The study hypothesizes that when the political factor moderates the relationship between the economic factor and import volume, the economic factor will have a positive effect on volume. More so, it assumes that the economic effect will be stronger when the political values are low. The study yields mixed results. In the combined model, the political factor has no impact on the relationship between the economic factor and e-waste import volume. This

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[21] Institutionalist approach argues that the domestic political structure is the most impactful factor that affects waste trade.

[22] Claire Brunel and Arik Levinson, "Measuring the Stringency of Environmental Regulations," *Review of Environmental Economics and Policy* 10, no. 1 (2016): 50.

result is likely to occur because combining the country types obscures the effects. The political factor affects the relationship between the economic factor and volume when country types are modeled separately. In developed countries, the economic factor has a stronger effect on volume when the value of the political factor is low. Conversely, in developing countries, the economic factor's impact on volume is strong regardless of the value of the political factor. Thus, in less democratic states that exhibit less freedom to trade, the economic factor plays a stronger role, while in states with more freedoms, the economic factor plays a more muted role in shaping e-waste import trade volumes. Notably, the factor is significant only in developing countries.[23]

The study expects that when the political factor moderates on the relationship between the environment and e-waste import volume, the environmental factor will have a negative effect on volume. It also expects that the environmental factor will have a larger effect on volume when the value of the political factor is high. This hypothesis is realized in all the models. Consequently, the findings refute the race to the bottom theory that conjectures that state's political structure, especially developing nations, create lax environmental regulations to legally increase toxic waste import volume. It is also worth mentioning that the results are not significant in all models.

[23] P values for each factor per model are indicated in Tables 4.6, 4.11, and 4.16.

Table 4.18 Hypotheses with Expected and Actual Factor Effects

	Expected Effect Size			Actual Effect Size			Actual Effect Size		
Hypothesis	Combined	Developed	Developing	Combined	Developed	Developing	Combined	Developed	Developing
H1: Economic factor impact on electronic waste import volume	large/+	large/+	large/+	medium/+*	medium/-	medium/+	0.385*	-0.16	0.17
H2: Political factor impact on electronic waste import volume	medium/+	medium/+	medium/+	small/+*	small/-	medium/+*	0.064*	-0.063	0.211*
H3: Environmental factor impact on electronic waste import volume	small/ -	small/ -	small/ -	small/-*	small/-	small/-*	-.073*	-0.04	-.092*
H4: The effect of the economic factor on electronic waste import volume depends on the political factor	+	+	+	+	-	-*	0.05	-0.26	0.896*
H5: The effect of the environmental factor on electronic waste import volume depends on the political factor	-	-	-	-	-	-	-0.012	-0.06	-0.028

small ≤ .10, medium ≈ .30, large ≥ .50 positive = (+) negative = (-)

* Significant: p value < .05

MEASUREMENT (VARIABLE) ASSESSMENT

Table 4.19 displays the expected and actual outer weights (loadings) of the indicators onto the factor. Relative importance is determined by the value of the outer weight. The higher the value the more important the variable. Table 4.20 outlines the variables' significance and importance. An indicator is significant if its outer weight p-value is less than .05 and is absolutely important if it's outer weight p-value is non-significant, greater than .05, but its outer loading is above .50.

GDP is expected to be important to the economic factor in all models. The findings indicate that GDP is of medium relative importance in the combined and developing models. GDP is of high relative importance in developed countries. Although, GDP is not significant in any model it is absolutely important when country types are evaluated independently.

Contrary to expectation, GDP/capita loads negatively on the economic factor when country types are modeled separately. Additionally, GDP/capita is not important to the economic factor in any of the models. These results are surprising because a substantial amount of waste trade literature emphasize and utilize GDP/capita as one of the most important indicators in assessing the economy of a country. Therefore, GDP/capita being irrelevant contradicts studies that suggest capital abundance plays a role in the economics of waste trade.

Additionally, current literature focuses on GDP the primary indicator of economy size. Many studies neglect the importance of the percent of goods and services exported. The results indicate that the percent of goods and services exported is a much more critical variable to the economy than literature suggests. It is the most relevant factor and of absolute importance in both the combined and developing models. It is worth mentioning that none of the economic variables are significant in any model.

The freedom to trade variable is expected to load positively on the political factor. Freedom to trade is the most important variable in the combined and developing countries model. However, it is not important in developed countries. This is surprising because although

developed countries are likely to have a diverse and larger portfolio of exported goods and services one would expect the percent of goods and services to be of importance to the economic factor regardless of the amount of exportation.

Polity, government type, is expected to load positively on the political factor in all models. This expectation is realized in all models. Additionally, polity is significant in all models. However, interestingly, polity matters more in developed countries as compared to developing countries.

As expected, corruption loads positively on the political factor in all the models. Interestingly, corruption is of the same level of importance in developed and developing countries. In some ways this is unexpected because it is a widely accepted belief that less advanced countries political system is prone to more corruption as compared to developed countries; consequently, one would assume corruption would be more important to the political factor in developing countries.

It is hypothesized that the environmental treaty indicator is important variable to the environmental factor. It is the most relevant variable in the combined and developing countries models. It is not as important in developed countries. This is odd because it is reasonable to assume that advanced nations have more concern and focus on maintaining environmental integrity.

Some literature suggests that the Basel Convention and Basel Ban Amendment are ineffective in managing waste trade. Therefore, it is expected that the ratification of will be negative (of low importance) on the environmental factor in all the models. The results indicate varied importance among the models. The Basel Convention and Ban Amendment are important to developed countries. In fact, they are not only of moderate relative importance to the factor they are also of absolute importance. Additionally, the Ban Amendment is nearly as important in developing countries as it is in advanced nations. However, the Basel Convention

is irrelevant to the environmental factor when the country types are combined and in developing countries.

Table 4.19 Expected and Actual Outer Weights Values

		Expected Outer Weights			Actual Outer Weights		
Factor	Variable	Combined	Developed	Developing	Combined	Developed	Developing
ECONOMIC	GDP	+	+	+	0.383	0.908	0.479
	GDP /capita (US $)	+	+	+	0.031	-0.248	-0.038
	Export of Goods and Services	+	+	+	0.931	-0.218	0.515
POLITICAL	Polity	+	+	+	0.67*	0.959*	0.616*
	Corruption	+	+	+	0.386*	0.352	0.344*
	Freedom to Trade	+	+	+	0.417*	-0.254	0.839*
ENVIRONMENT	Environmental Treaties	+	+	+	0.936*	0.186	0.781*
	Basel Convention	-	-	-	-0.3*	0.517	-0.359*
	Basel Ban Amendment	-	-	-	0.354	0.686	0.512*

positive = (+) negative = (-)
* Significant: p-value < .05

Table 4.20 Variable Importance Comparison

Factor	Variable	Combined	Developed	Developing
ECONOMIC	GDP		Absolutely Important	Absolutely Important
	GDP /capita (US $)		Absolutely Important	
	Export of Goods and Services	Absolutely Important		Absolutely Important
POLITICAL	Polity	Significant	Absolutely Important	Significant
	Corruption	Significant		Significant
	Freedom to Trade	Significant	Significant	Significant
ENVIRONMENT	Environmental Treaties	Significant		Significant
	Basel Convention	Significant	Absolutely Important	Significant
	Basel Ban Amendment		Absolutely Important	Significant

Significant: p-value < .05

Absolutely Important: p-value > .05 and outer loading weight is > .50

CHAPTER 5

PRE- & POST BASEL SHIFT: FROM TRASH TO TREASURE

Arguably the surplus of electronic goods and their valuable components exacerbated global electronic waste trade and created a profitable industry. In 2008 the Basel Convention recognized the benefits of waste and altered its view on hazardous waste from it being a value less by-product to seeing it as a resource.[1] The convention asserts, "the extraction of valuable secondary raw material from wastes can create green business opportunities and decent jobs for millions of often young people throughout the developing world, thus playing a part in eradicating poverty."[2] Some scholars contend that Basel's shift on waste promotes nation-states to alter their environmental and trade policies to increase waste import volume.[3] This analysis evaluates the economic, political and environmental factors impact on electronic waste import volume before and after Basel revised its view.

HYPOTHESES

Table 5.1 outlines the five primary hypotheses. The hypotheses are based on current literature and prior empirical studies assessing factors that impact electronic waste import volume.[4] Electronic waste trade is governed by both international and domestic regulations. However, following the domestic institutionalist theory, I posit that domestic factors have a greater impact on electronic waste import volume than international initiatives. Therefore, Basel shifting its view on waste does not alter the effect size of factors that impact electronic waste import

[1] Basel Convention, "Our Sustainable Future: The Role of the Basel Convention," 3.

[2] Basel Convention, 3.

[3] Lucier and Gareau.

[4] Results from Chapter 4.

Hypotheses 1a-c identify the impact the economic factor has on electronic waste import volume. Building on previous empirical results[5], in all models, I expect the economic factor has a positive, medium sized effect on electronic waste import volume pre and post shift.

Hypotheses 2a-c highlight the impact the political environment has on electronic waste import volume. Prior studies indicate that the government does not have a strong relationshiop with e-waste volume.[6] Therefore, the political factor is expected to have a positive small effect in the combined model pre and post the shift. It is also hypothesized that the political factor has a small effect in developed countries pre and post the Basel shift. However, volume is expected to decrease pre-shift and increase post shift. I hypothesize that the political factor in developing countries has a positive, medium sized effect on e-waste volume pre-Basel shift and a positive, small effect post shift.

Hypotheses 3a-c measure the impact of environmental policies on electronic waste import volume. The purpose of environmental policies and initiatives is to protect humans, animals and the environment from harmful effects. This study conjectures that despite Basel's shift, these efforts are effective in managing electronic waste trade practices. Therefore, it is hypothesized that the environmental factor has a small negative effect on e-waste import volume pre and post Basel shift in all the models.

Hypotheses 4a-c identify the economic factor's relationship with electronic waste import volume when the political factor intervenes in the relationship. It is expected that the political economic factor increases import volume in both country types when the political factor moderates on the relationship between the economic factor and volume, in all models pre and post shift. This is a reasonable assumption because developed countries' regulatory structure can support e-waste importation because they possess the capital necessary to procure machinery to safely recycle and repurpose e-waste components. Alternatively, developing

[5] Results from Chapter 4.

[6] Ibid.

countries' regulations promote import volume because they lack sufficient capital and view importing e-waste as a source of revenue

Hypotheses 5a-c assumes that environmental initiatives are effective in managing waste. Additionally, it assumes that a nation's political structure supports these endeavors. Therefore, it is hypothesized that import volume decreases when the political factor moderates on the relationship between the environmental factor and e-waste volume, in all models pre and post shift.

Table 5.1 Hypotheses and Expected Effect Size - Pre and Post Basel Shift

	Expected Effect Size Pre Basel Shift			Expected Effect Size Post Basel Shift		
Hypothesis	Combined	Developed	Developing	Combined	Developed	Developing
H1: Economic factor impact on electronic waste import volume	medium/+	medium/+	medium/+	medium/+	medium/+	medium/+
H2: Political factor impact on electronic waste import volume	small/+	small/-	medium/+	small/+	small/+	small/+
H3: Environmental factor impact on electronic waste import volume	small/-	small/-	small/-	small/-	small/-	small/-
H4: The effect of the economic factor on electronic waste import volume depends on the political factor	+	+	+	+	+	+
H5: The effect of the environmental factor on electronic waste import volume depends on the political factor	-	-	-	-	-	-

small ≤ .10, medium ≈ .30, large ≥ .50 positive = (+) negative = (-)

PRE BASEL SHIFT

The pre-Basel shift analysis, from 1996 to 2006, evaluates 372 country-years of developed and developing countries, 152 and 220 respectively. Tables 5.2 and 5.3 illustrate the variables' descriptive statistics and correlation values before Basel shifted its view on waste.

Table 5.2 Descriptive Statistics - Pre Basel Shift

Indicator	Mean	Median	Min	Max	Standard Deviation
Volume (tons)	5,204.89	44.35	0.00	115,352.79	12,710.96
GDP (USD millions)	445,831.83	67,561.29	717.53	13,855,888.00	1,432,437.22
GDP/capita	12,688.33	5,065.34	111.53	88,680.24	15,241.43
% Exports	42.88	36.88	0.00	216.34	29.18
Polity	4.05	8.00	-99.00	10.00	14.30
Corruption	-4.50	4.00	-99.00	10.00	30.06
Trade Freedom	66.93	73.00	-99.00	90.00	24.92
Enviro Treaties	2.77	3.00	0.00	7.00	1.65
Basel Entry	0.91	1.00	0.00	1.00	0.29
Ban Amend	0.30	0.00	0.00	1.00	0.46
Population (millions)	55.05	10.59	0.27	1,280.40	170.85
Population Density	339.47	80.33	-99.00	21,595.35	1,767.01

Table 5.3 Correlation - Pre Basel Shift

Indicator	GDP	GDP/ capita	% Exports	Polity	Corruption	Trade Freedom	Enviro Treaties	Basel Entry	Ban Amend	Population	Population Density	Landlock
GDP	1											
GDP/capita	0.352	1										
% Exports	-0.207	0.278	1									
Polity	0.105	0.038	-0.103	1								
Corruption	0.11	0.246	-0.012	0.071	1							
Trade Freedom	0.118	0.281	0.045	0.077	0.334	1						
Enviro Treaties	-0.26	-0.417	-0.095	-0.114	-0.012	-0.072	1					
Basel Entry	-0.271	0.113	0.103	0.057	0.327	0.239	0.053	1				
Ban Amend	-0.026	0.359	0.165	0.162	0.151	0.152	-0.074	0.167	1			
Population	0.245	-0.097	-0.212	0.012	0.071	-0.194	0.001	0.002	-0.089	1		
PopDensity	-0.031	0.091	0.356	-0.104	-0.145	-0.528	-0.14	-0.063	-0.023	-0.025	1	
Landlock	-0.129	-0.031	0.085	0.023	-0.092	-0.04	-0.009	-0.181	0.029	-0.123	-0.069	1

COMBINED MODEL

MEASUREMENT MODEL ASSESSMENT

Collinearity

Table 5.4 reports the variance inflation factor (VIF) values for all the indicators. All values are between .20 and 5, hence collinearity is not an issue.[7]

Table 5.4 Outer VIF - Pre Basel Shift Combined Model

	VIF
% Exports	1.22
BanAmend	1.04
BaselEntry	1.03
Corruption	1.13
Economic * Political	1.00
Environmental * Political	1.00
GDP	1.29
GDP/Capita	1.34
Landlock	1.00
Polity	1.01
PopDens	1.00
Population	1.00
Trade Freedom	1.13
Treaties	1.01

Significance and Relevance of the Indicators

The outer weight value expresses a variable's level of relative importance, or its relative contribution, to forming the factor. The higher the value, the more important the indicator is to the factor.[8] The significance of a variable, an indication of whether the variable significantly contributes to the its corresponding construct, is determined by the p-value of the outer weight.

[7] Hair, 143.

[8] Ibid., 146.

An indicator is significant if its outer weight p-value is less than .05. An indicator is absolutely important if it's outer weight p-value is nonsignificant, greater than .05, but its outer loading is above .50.[9]

Table 5.5 outlines the weight (importance) and significance of the indicators. In the combined model, all the economic variables are statistically significant. The gross domestic product is the most critical variable to the economic factor, .897. GDP/capita is important, .679. The percent of exports of goods and services is the least important indicator to the economic factor, -.234.

Polity, the extent to which a government is democratic, is the most important indicator to the political factor, outer weight .625. The freedom to trade is of medium importance with an outer weight of .418. Corruption is also of medium importance to the political factor, outer weight .470. All political variables are statistically significant.

The number of environmental treaties a country participates in is the most critical indicator to the environmental factor with an outer weight of .998. Environmental treaties is the only significant variable to the environmental factor. The Ban Amendment is of low importance with an outer weight of .095. Ratification of the Basel Convention is essentially irrelevant, -.188. Neither the Basel Convention nor the Basel Ban Amendment are significant nor of absolute importance.

[9] Absolute importance is the information an indicator provides without considering the other indicators. Ibid., 148.

Table 5.5 Variable Results - Pre Basel Shift Combined Model

Factor	Variable	Outer Weights (Outer Loadings)	t Value	p Value	Significance p value < .05
ECONOMIC	GDP	.670 (.897)	4.48	0.00	Yes
	GDP /capita (US $)	.508 (.679)	2.82	0.00	Yes
	% Export Goods and Services	-.234 (-.232)	1.95	0.05	Yes
POLITICAL	Polity	.625 (.691)	11.25	0.00	Yes
	Corruption	.470 (.655)	5.34	0.00	Yes
	Freedom to Trade	.418 (.623)	3.50	0.00	Yes
ENVIRONMENT	Environmental Treaties	.998 (.981)	7.13	0.00	Yes
	Basel Convention	-.188 (-.120)	1.04	0.30	No
	Basel Ban Amendment	.095 (.009)	0.45	0.65	No

STRUCTURAL PATH MODEL ASSESSMENT (Test of Hypotheses)

Collinearity

The variance inflation factor (VIF) was assessed to determine if collinearity issues among the factors exist. Table 5.6 reports the VIF values for all the factors. All values are within .20 and 5, hence indicating that collinearity issues do not exist.

Table 5.6 Inner VIF - Pre Basel Shift Combined Model

	VIF
Economic	2.48
Environmental	1.27
Landlock	1.09
Pol -> Econ	2.18
Pol -> Enviro	1.84
Political	1.59
Pop Density	1.97
Population	1.06

Assessment of path coefficients

Table 5.7 outlines the standardized values and significance of the path coefficients (factors). Estimated coefficients closer to +1 represent a strong positive relationship.[10] The economic factor has the largest effect on electronic waste import volume. A one-unit change in the economic factor increases e-waste import volume .172 standard deviations, 2,186 tons[11], when all the other factors are held constant. The political factor has a small impact on volume. A one-unit change in the political factor increases import volume .115 standard deviations, 1,462 tons. The environmental factor yields a small decrease in e-waste import volume. When the environmental factor changes by one-unit, volume decreases .122 standard deviations, 1,551 tons.

[10] Ibid., 195.

[11] Table 8A displays the calculated estimated weight change for each model. Weight is calculated by multiplying the standard deviation of the import volume by the factor's path coefficient.

Table 5.7 Structural Path Results - Pre Basel Shift Combined Model

Paths	Path Coefficients	t Value	p Value	Significance p value < .05
Economic --> Import Volume	0.172	2.06	0.04	Yes
Political Economy --> Import Volume	-0.019	0.19	0.85	No
Political --> Import Volume	0.115	2.29	0.02	Yes
Political Environment --> Import Volume	-0.018	0.44	0.66	No
Environment --> Import Volume	-0.122	3.38	0.00	Yes

small ≤ .10, medium ≈ .30, large ≥ .50 positive = (+) negative = (-)

The model evaluates the economic and environmental factors' effect on electronic waste volume under the assumption that the political factor impacts the relationship between the factors and e-waste import volume. Figure 5.1 demonstrates the effect size of the economic factor based on the value of the political factor. The relationship between the economic factor and volume is relatively the same regardless of the value of the political factor (all slopes of the lines are similar). This is an indication that the political structure does not impact the relationship between the economic factor and electronic waste import volume. Notably, in all 3 cases, import volume increases (upward slope of the lines) as the economic factor gets larger. This suggests that nations with varying political structures value importing electronic waste.

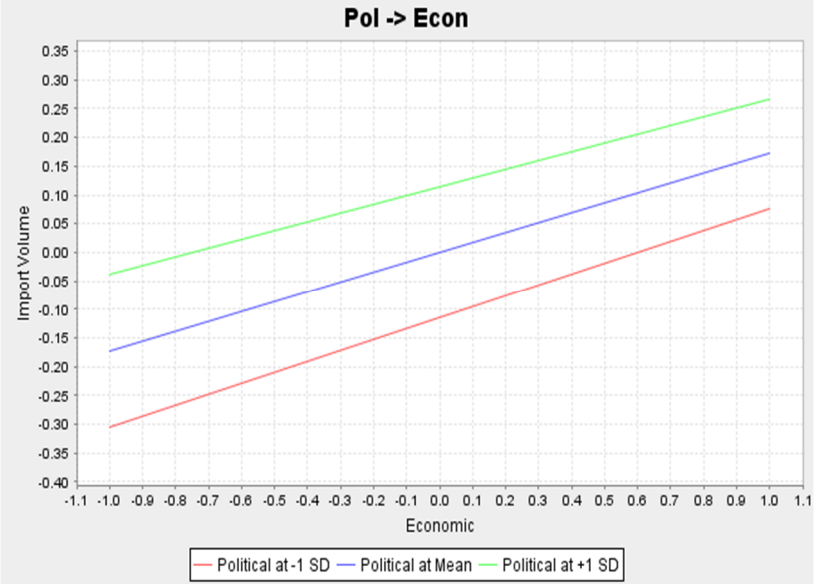

Fig. 5.1 Effect of Economic Factor Conditional on Value of Political Factor - Pre Shift Combined

Figure 5.2 illustrates the effect size of the environmental factor based on the value of the political factor. Combining the country types does not produce significant differences between levels of political values. When the value of the political factor is high, the relationship between the environment and import volume is slightly higher as compared to when the political value is lower. In all 3 cases, as the environmental factor gets larger, import volume decreases. This is an indication that regardless of a country's openness to trade the political factor does not thwart the environmental factor's purpose in decreasing electronic waste import volume. However, it is important to note that merging the country types might disguise the political factor's influence as evidenced by more fruitful effects when country types are modeled separately.

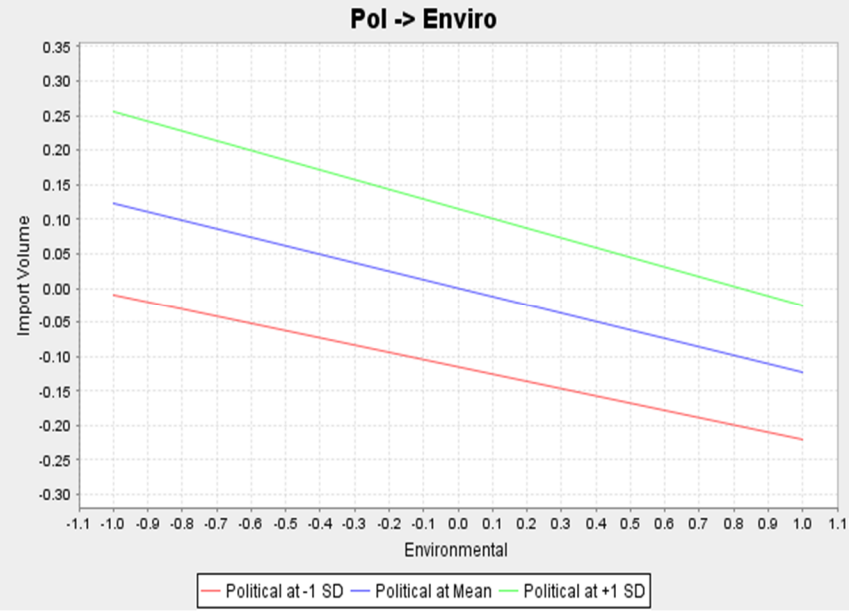

Fig. 5.2 Effect of Environmental Factor Conditional on Value of Political Factor - Pre Shift Combined

Assessment of R^2 (Coefficient of Determination)

Economic, political and environmental factors explain roughly 10% of electronic waste importation volume when both developed and developing countries are evaluated in the same model.

Effect size of f^2

The effect size of the construct, f^2, was tested to determine whether a construct has a substantive impact on the endogenous factor if it is omitted from the model.[12] f^2 values less than .02, .02, .15 and .35 respectively, represent no effect, small, medium or large effect on the dependent variable. None of the factors will have a statistical effect on e-waste import volume if they are excluded.

[12] Hair, 201.

Table 5.8 f^2 - Pre Basel Shift Combined Model

	Import Volume
Economic	0.01
Environmental	0.01
Landlock	0.01
Pol -> Econ	0.00
Pol -> Enviro	0.00
Political	0.01
Population Density	0.00
Population	0.00

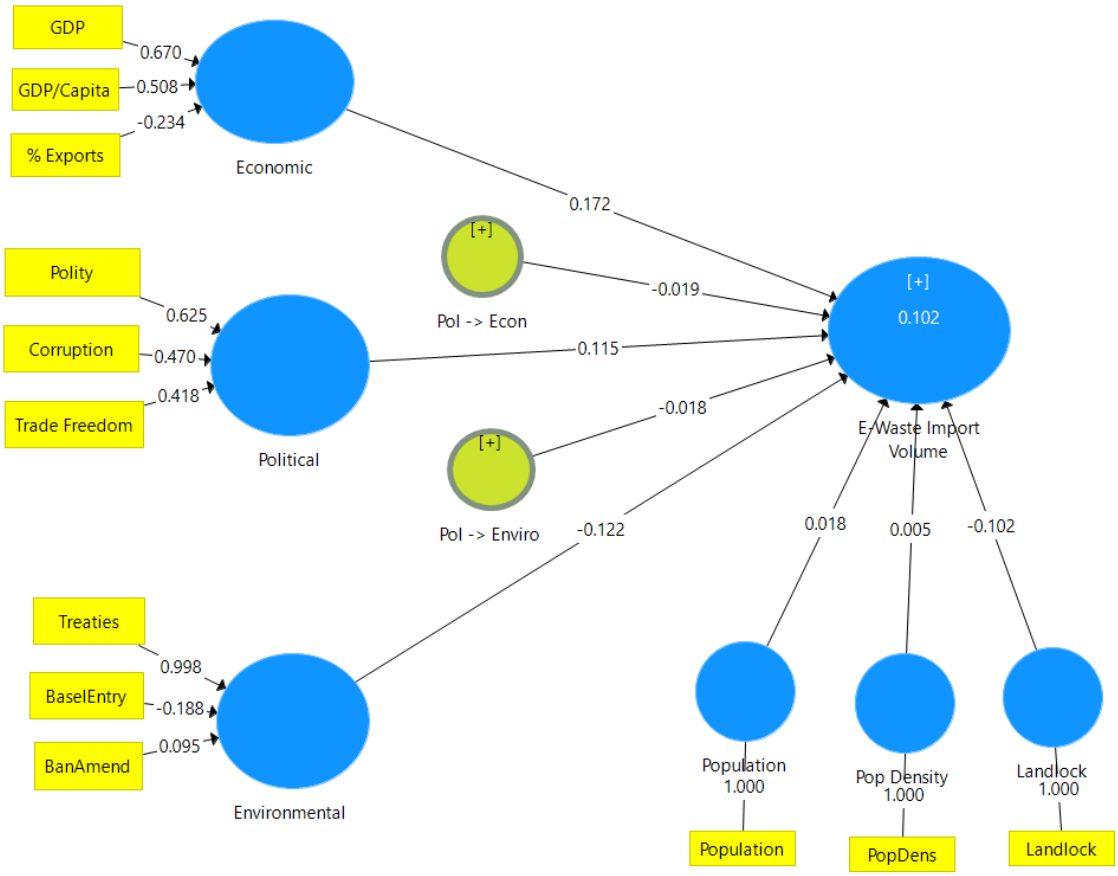

Fig. 5.3 Structural Equation Model – Pre Basel Shift Combined Model

DEVELOPED MODEL

MEASUREMENT MODEL ASSESSMENT

Collinearity Issues

Table 5.9 reports the VIF values for all the indicators. All values are less than 5, hence collinearity is not an issue.

Table 5.9 Outer VIF - Pre Basel Shift Developed Model

	VIF
% Exports	1.20
BanAmend	1.04
BaselEntry	1.10
Corruption	1.52
Economic * Political	1.00
Environmental * Political	1.00
GDP	1.25
GDP/Capita	1.13
Landlock	1.00
Polity	1.01
PopDens	1.00
Population	1.00
Trade Freedom	1.54
Treaties	1.06

Significance and Relevance of the Indicators

Table 5.10 illustrates the significance and relevance of the indicators in the developed model. Gross domestic product is the most important variable to the economic factor and is of absolute importance, .808.[13] GDP/capita is of little importance, .059. The percent of exports of goods and services is nearly irrelevant to the economic factor in developed countries, -.361. None of the economic variables are statistically significant.

[13] Outer weight p-value is nonsignificant, greater than .05, and its outer loading is above .50

Polity is the most important indicator to the political factor and is statistically significant, outer weight .946. Corruption is of medium important to the political factor with outer weight, .366. The freedom to trade is the least important variable to the political factor, -.087. Corruption and freedom to trade are not statistically significant nor of absolute importance.

Ratification of the Basel Convention is the only significant variable and the most critical to the environmental factor. The number of environmental treaties a country participates in is slightly important to the environmental factor, outer weight .296. Although it is not a significant variable it is of absolute importance. The Ban Amendment is the least important indicator importance with an outer weight of -.154.

Table 5.10 Variable Results - Pre Basel Shift Developed Model

Factor	Variable	Outer Weights (Outer Loadings)	t Value	p Value	Significance p value < .05
ECONOMIC	GDP	0.808 (.943)	1.89	0.06	No
	GDP /capita (US $)	.059 (.208)	0.24	0.81	No
	% Export Goods and Services	-.361 (-.623)	1.10	0.27	No
POLITICAL	Polity	.946 (.947)	2.96	0.00	Yes
	Corruption	.366 (.337)	0.46	0.65	No
	Freedom to Trade	-.087 (.214)	0.10	0.92	No
ENVIRONMENT	Environmental Treaties	.296 (.512)	0.94	0.35	No
	Basel Convention	.901 (.944)	3.29	0.00	Yes
	Basel Ban Amendment	-.154 (.014)	0.41	0.68	No

STRUCTURAL PATH MODEL ASSESSMENT (Test of Hypotheses)

Collinearity

The VIFs for the economic and population factors have values above 5, indicating that collinearity issues exist. The collinearity issue is resolved when population is omitted from the model.[14] However, it is not necessary to delete population because it is a control factor. The economic factor is not eliminated because literature indicates that it is essential to the model.

Table 5.11 Inner VIF - Pre Basel Shift Developed Model

	VIF
Economic	11.18
Environmental	3.67
Landlock	1.35
Pol -> Econ	2.97
Pol -> Enviro	2.47
Political	3.44
Pop Density	2.36
Population	13.03

Assessment of path coefficients

The economic factor has a small to medium effect on volume. When the economic factor changes by one unit, e-waste import volume increases .173 standard deviations, 2,088 tons[15], holding all other factors constant. The political factor has a small effect on e-waste volume. When the political factor changes one unit, volume increases .088 standard deviations, 1,062 tons. The environmental factor has the largest effect on electronic waste import volume. A one-unit change in the environmental factor decreases volume .214 standard deviations, 2,583 tons. It is critical to note that none of the factors are significant.

[14] The VIF for the economic factor is 3.57 when the population factor is excluded from the model.

[15] Table 8A displays the calculated estimated weight change for each model. Weight is calculated by multiplying the standard deviation of the import volume by the factor's path coefficient.

Table 5.12 Structural Path Results - Pre Basel Shift Developed Model

Paths	Path Coefficients	t Value	p Value	Significance p value < .05
Economic --> Import Volume	-0.173	0.64	0.52	No
Political Economy --> Import Volume	-0.098	0.21	0.83	No
Political --> Import Volume	0.088	0.26	0.79	No
Political Environment --> Import Volume	-0.029	0.05	0.96	No
Environment --> Import Volume	-0.214	1.02	0.31	No

small ≤ .10, medium ≈ .30, large ≥ .50 positive = (+) negative = (-)

The model assumes that the political factor influences the relationship between the economic and environmental factors. Figure 5.4 illustrates the effect size of the economic factor based on the value of the political factor. The economic factor is stronger when the value of the political factor is higher (a steeper slope when the political value is 1 standard deviation above the mean). In all three cases, as the economic factor gets larger, volume decreases. This result suggests that the influence of the political factor decreases import volume despite the economic benefits of importing electronic waste.

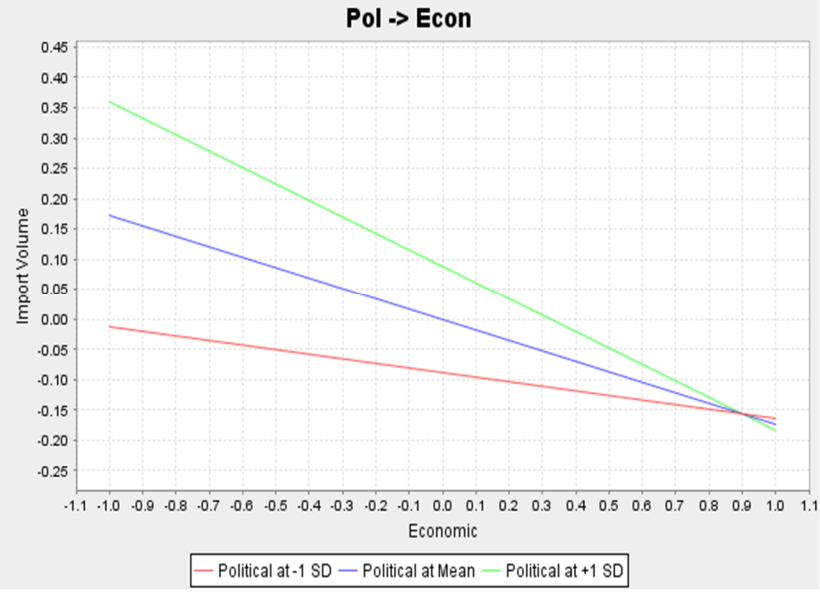

Fig. 5.4 Effect of Economic Factor Conditional on Value of Political Factor - Pre Shift Developed

Figure 5.5 demonstrates the effect size of the environmental factor based on the value of the political factor. The relationship between the environmental factor and volume is slightly stronger when the political factor is higher (a steeper slope when the political value is 1 standard deviation above the mean). Conversely, when the political value is low, the environmental factor has a weaker effect on electronic waste import volume. In all three cases, electronic waste import volume decreases as the environmental factor gets larger. This suggests that the political structure does not hinder environmental initiatives to reduce hazardous waste import volume.

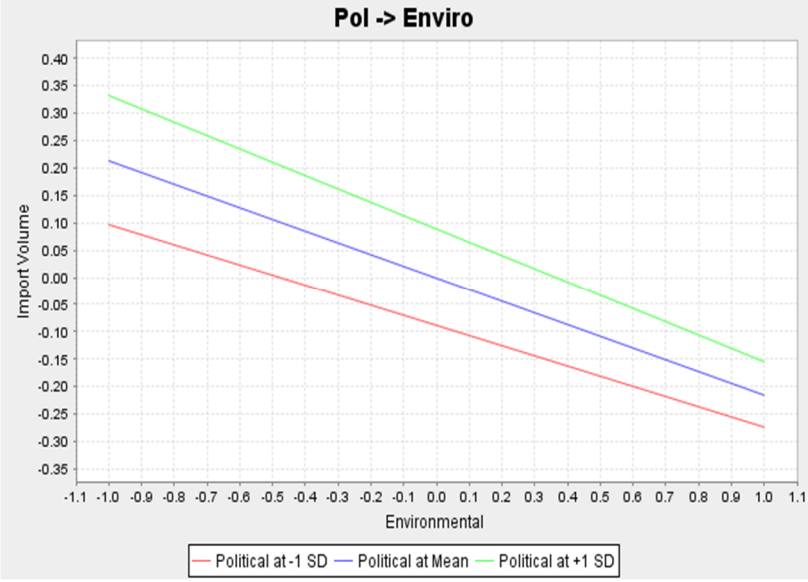

Fig. 5.5 Effect of Environmental Factor Conditional on Value of Political Factor - Pre Shift Developed

Assessment of R^2 (Coefficient of Determination)

The R^2 for the developed model is .114.[16] Economic, political and environmental factors explain roughly 11% of electronic waste importation volume in developed countries.

Effect size of f^2

The effect size, f^2, of each construct was tested to assess whether it has a substantive impact on the endogenous factor if it is omitted from the model.[17] If landlock were deleted from the model it would have a small effect on volume. None of the other factors will statistically affect the model if they were excluded waste volume if they were omitted.

[16] The R^2 does not change when population is omitted from the model to correct collinearity issues.

[17] f^2 values less than .02, .02, .15 and .35 respectively, represent no effect, small, medium or large effect on the dependent variable.

Table 5.13 f^2 - Pre Basel Shift Developed Model

	Import Volume
Economic	0.00
Environmental	0.01
Landlock	0.03
Pol -> Econ	0.00
Pol -> Enviro	0.00
Political	0.00
Population Density	0.01
Population	0.00

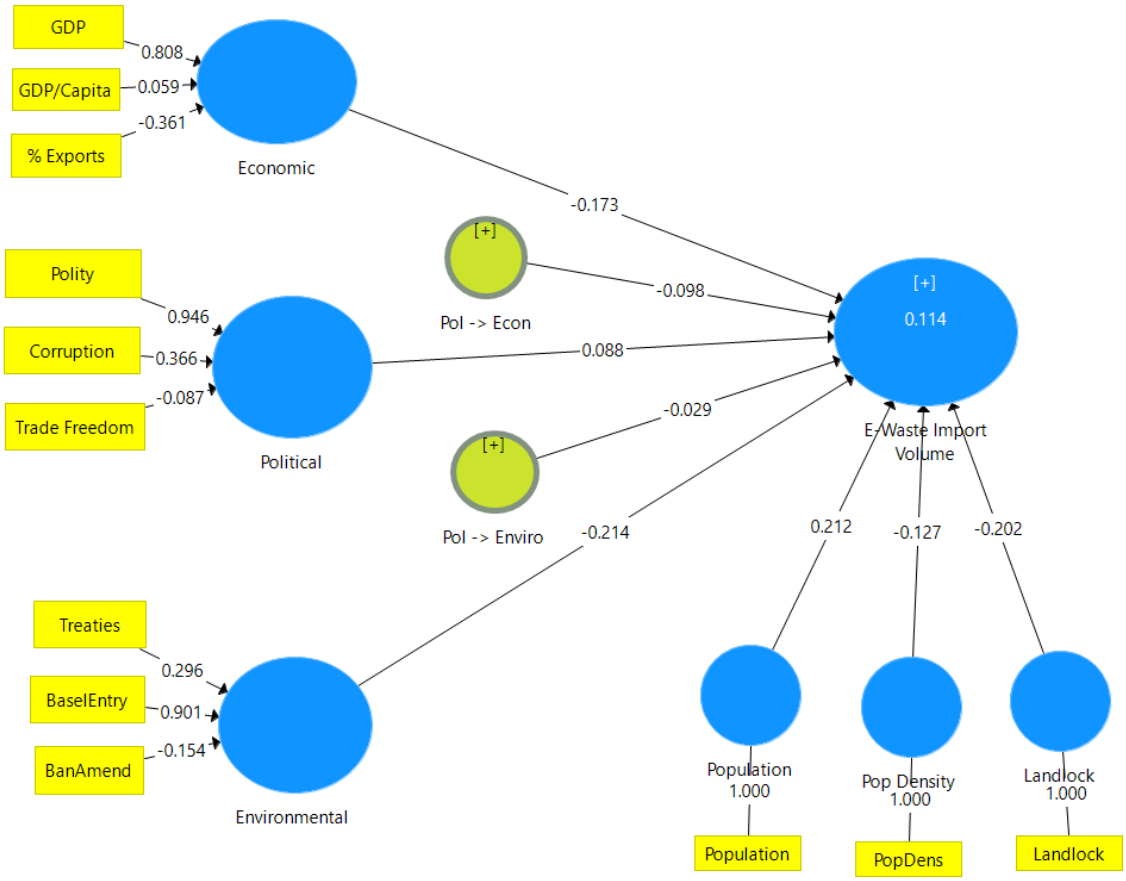

Fig. 5.6 Structural Equation Model - Pre Basel Shift Developed Model

DEVELOPING MODEL

MEASUREMENT MODEL ASSESSMENT

Collinearity

The VIFs for the path coefficients are between .20 and 5, indicating that no collinearity issues exist.

Table 5.14 Outer VIF - Pre Basel Shift Developing Model

	VIF
% Exports	1.15
BanAmend	1.02
BaselEntry	1.02
Corruption	1.05
Economic * Political	1.00
Environmental * Political	1.00
GDP	1.07
GDP/Capita	1.10
Landlock	1.00
Polity	1.01
PopDens	1.00
Population	1.00
Trade Freedom	1.04
Treaties	1.01

Significance and Relevance of the Indicators

Table 5.15 outlines the significance and relevance of the indicators in the developing model. The gross domestic product is the most critical variable to the economic factor relevant, outer weight 1.00. GDP/capita is of little importance, .06. Both GDP and GDP/capita are statistically significant. The percent of exports of goods and services is also relatively unimportant to the economic factor, .048.

All variables on the political factor are significant. Polity, the extent to which a government is democratic, is the most important indicator, .631. Corruption and freedom to trade are moderately important, outer weight .453 and .495.

The number of environmental treaties a country participates in is the most critical indicator to the environmental factor with an outer weight of .822, and is the only significant variable. The Ban Amendment is of medium importance with an outer weight of .449 and is of absolute importance.[18] Ratification of the Basel Convention is the least important indicator, -.407.

Table 5.15 Variable Results - Pre Basel Shift Developing Model

Factor	Variable	Outer Weights (Outer Loadings)	t Value	p Value	Significance p value < .05
ECONOMIC	GDP	1.00 (.996)	4.48	0.00	Yes
	GDP /capita (US $)	.069 (.157)	2.82	0.00	Yes
	% Export Goods and Services	.048 (-.145)	1.95	0.05	No
POLITICAL	Polity	.631 (.681)	11.25	0.00	Yes
	Corruption	.453 (.617)	5.34	0.00	Yes
	Freedom to Trade	.495 (.588)	3.50	0.00	Yes
ENVIRONMENT	Environmental Treaties	.822 (.822)	7.13	0.00	Yes
	Basel Convention	-.407 (-.300)	1.04	0.30	No
	Basel Ban Amendment	.449 (.450)	0.45	0.65	No

[18] Outer loading rounds to .50.

STRUCTURAL PATH MODEL ASSESSMENT (Test of Hypotheses)

Collinearity

The inner VIFs were assessed to determine if collinearity exists among the factors. None of the factor exhibit collinearity issues.[19]

Table 5.16 Inner VIF - Pre Basel Shift Developing Model

	VIF
Economic	2.80
Environmental	1.14
Landlock	1.22
Pol -> Econ	1.77
Pol -> Enviro	1.12
Political	1.37
Pop Density	1.14
Population	3.76

Assessment of path coefficients

Table 5.17 reports the standardized values and significance of the path coefficients. The economic factor has a large significant effect on e-waste volume. When the economic factor changes by one unit, e-waste import volume increases .559 standard deviations, 7,140 tons[20], holding all other factors constant. The political factor has a significant small to medium sized effect on volume. A one-unit change in the political factor increases e-waste import volume .185 standard deviations, 2,363 tons. Alternatively, the environmental factor has a small negative effect on volume. A one-unit change in the environmental factor decreases volume .10 standard deviations, 1,277 tons. Although the effect is small, the environmental factor is significant.

[19] No collinearity issues exist if VIF value is between .20 and 5.

[20] Table 8A displays the calculated estimated weight change for each model. Weight is calculated by multiplying the standard deviation of the import volume by the factor's path coefficient.

Table 5.17 Structural Path Results - Pre Basel Shift Developing Model

Paths	Path Coefficients	t Value	p Value	Significance p value < .05
Economic --> Import Volume	0.559	2.64	0.01	Yes
Political Economy --> Import Volume	0.472	2.74	0.01	Yes
Political --> Import Volume	0.185	2.15	0.03	Yes
Political Environment --> Import Volume	-0.056	1.62	0.11	No
Environment --> Import Volume	-0.100	2.61	0.01	Yes

small ≤ .10, medium ≈ .30, large ≥ .50 positive = (+) negative = (-)

Figure 5.7 demonstrates the effect size of the economic factor on electronic waste import volume based on the value of the political factor. Import volume increases in all 3 cases as the economic factor gets stronger. However, the relationship between the economic factor and volume is stronger when the value of the political factor is higher (a steeper slope when the political value is 1 standard deviation above the mean). Alternatively, the economic factor has a weaker effect when the political factor is low (a less steep slope when the political value is 1 standard deviation below the mean). These effects suggest that countries that are more democratic and more open to trade take advantage of its neoliberal/free market structure and import e-waste.

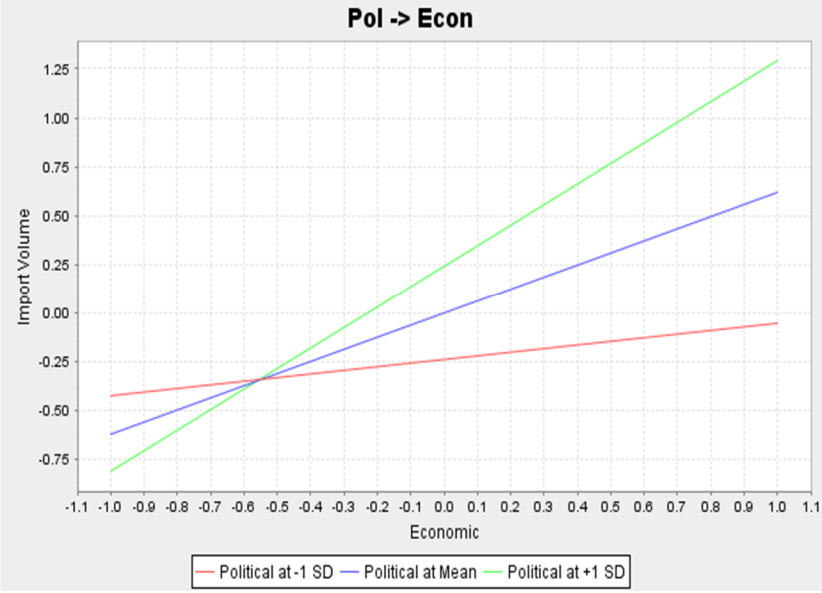

Fig. 5.7 Effect of Economic Factor Conditional on Value of Political Factor - Pre Shift Developing

Figure 5.8 illustrates the effect size of the environmental factor on e-waste import volume based on the value of the political factor. The environmental factor has a stronger relationship when the value of the political factor is higher (a steeper slope when the political value is 1 standard deviation above the mean). Alternatively, the environmental factor has relatively no effect on import volume when the political value is low (no slope when the political value is 1 standard deviation below the mean). Accordingly, when the political value is low, as the environmental factor gets larger, volume does not increase nor decrease. Alternatively, when the political value is high, waste import volume decreases. Hence, it is likely that these countries are more democratic, want to participate in the global economy and consequently adhere to international environmental agreements.

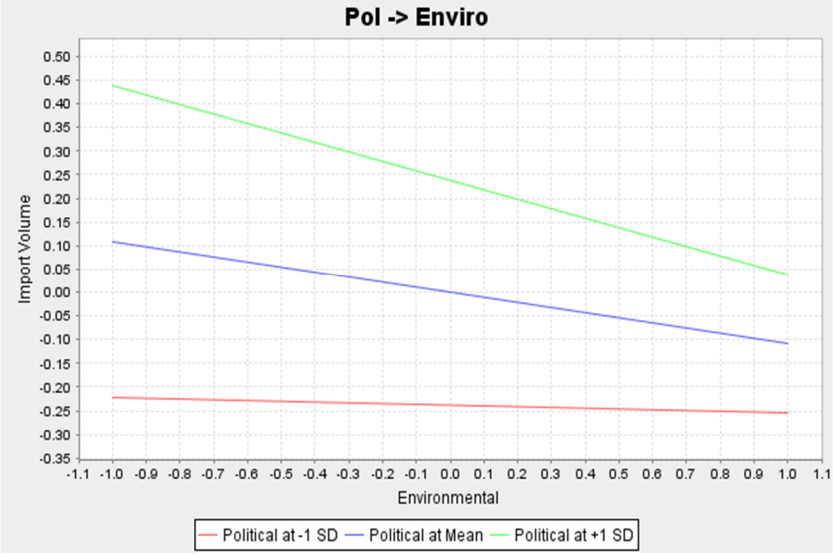

Fig. 5.8 Effect of Environmental Factor Conditional on Value of Political Factor - Pre Shift Developing

Assessment of R^2 (Coefficient of Determination)

The R^2 for the developing model is .38. Economic, political and environmental factors explain approximately 38% of electronic waste importation volume in developing countries.

Effect size of f^2

The effect size, f^2, of each construct was tested to assess whether it has a substantive impact on the endogenous factor if it is omitted from the model.[21] Excluding the economic and political economic factors from the model would have a medium effect on e-waste import volume. Omitting the political factor would have a small effect on volume. Precluding the political factor would have a small to medium effect on volume. Deleting all other variables from the model would not impact e-waste volume.

[21] f^2 values less than .02, .02, .15 and .35 respectively, represent no effect, small, medium or large effect on the dependent variable.

Table 5.18 f^2 - Pre Basel Shift Developing Model

	Import Volume
Economic	0.18
Environmental	0.01
Landlock	0.00
Pol -> Econ	0.13
Pol -> Enviro	0.01
Political	0.04
Population Density	0.00
Population	0.01

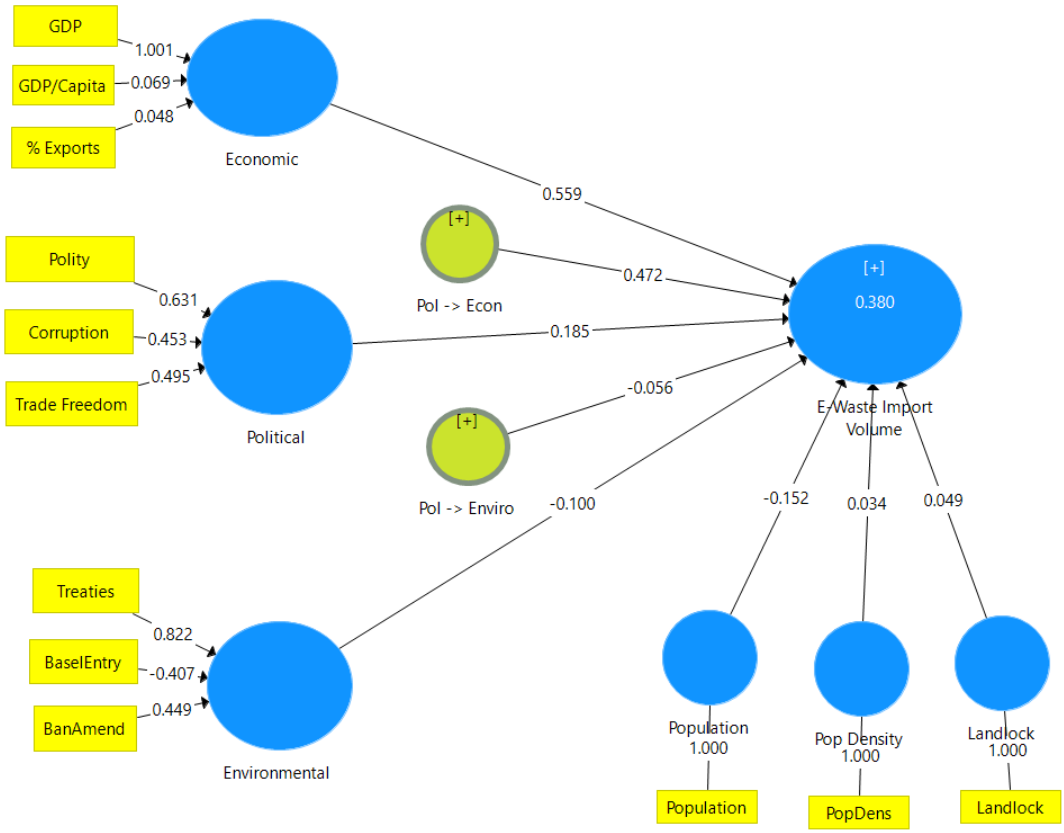

Fig. 5.9 Structural Equation Model - Pre Basel Shift Developing Model

PRE BASEL SHIFT FINDINGS AND THEORETICAL IMPLICATIONS

STRUCTURAL (FACTOR) ASSESSMENT

The pre Basel shift analysis indicates that economic, political and environmental factors better explain electronic waste import volume in developing countries, (38%) as compared to developed countries (11%) and combined country types (10%).

Table 5.19 outlines the hypotheses with expected and actual effect sizes and the significance of each factor for the models. The results indicate that the primary driver of e-waste varies between country types. The economic factor is the primary influencer to e-waste volume in developing countries and when country types are evaluated together. Therefore, the economic nationalist theory best explains waste importation in these models. Alternatively, e-waste volume in developed countries is driven by the environmental factor. Consequently, the neoliberal international institutionalism best explains waste importation practices in developed countries. Notably, none of the factors are significant in the developed model. Conversely, nearly of all the factors have a significant effect on e-waste volume in developing countries.[22]

The economic factor is expected to moderately increase e-waste import volume in both the developed and developing model. This is true in developed countries. However, the economic factor has a large effect on e-waste import volume in developing countries. This suggests that the economic factor is a key driver to e-waste importation in developing countries and not as powerful in developed countries. This also illustrates that the economic nationalist theory's assertion that trade practices are determined by economic variables, is more so applicable to developing countries as compared to developed nations.

The environmental factor is hypothesized to have a small, negative effect in developed and developing countries. This is realized in the developing model. Alternatively, the environmental factor has a larger effect in the combined and developed models than what is

[22] P values for each factor per model are indicated in Tables 5.7, 5.12 and 5.17.

hypothesized. More so, in all models the environmental factor reduces hazardous waste import volume. Hence, the results provide support for the liberal institutionalist theory, the notion that international environmental agreements are effective in managing global hazardous waste concerns.

The political factor is expected to have a small negative effect on e-waste volume in developed countries and a medium positive effect in developing countries. Surprisingly, the political factor has a small effect in developed countries and a medium sized effect in developing countries. The political factor is not the primary driver of electronic waste import volume in neither developed nor developing countries. These results demonstrate that the institutional approach, the assertion that the political factor is the most influential factor to waste trade, is not true in any of the models. However, the direction and size of the effect are compelling. The political factor increases e-waste import volume in both developed and developing countries. This suggests that nations import waste regardless of the political structure. Therefore, the notion that developed states regulatory structure is stricter than developing countries which leads to reduced waste import volume is not supported.

In all the models, it is hypothesized that volume decreases when the political factor moderates on the relationship between the environmental factor and volume. It is also expected that the environmental factor will have a stronger effect on volume when the political factor is larger. This holds true in all models. This effect in developing countries rebuts proponents of the race to the bottom theory who conjecture that the government in developing countries lax environmental regulations to import more electronic waste. When the political factor moderates on the relationship between the economic factor and e-waste volume, it is expected that the economic factor will have a positive and stronger effect on volume when the political factor is lower, in all model types. The hypothesis is rejected in the developed model. The economic factor has a stronger relationship with e-waste import volume when the political values are high. Additionally, volume decreases as the economic factor gets larger. The hypothesis is partially

accepted in the combined and developing model. In the combined model that political factor does not impact the relationship between the economic factor and volume. However, regardless of the political value import volume increases as the economic factor gets larger. Alternatively, in the developing model, the economic factor has a stronger effect when the political factor is low. Nonetheless, volume increases as the economic factor gets larger at all political levels. Furthermore, the political economy effect size is small in developed countries and is nearly large in developing countries. These results suggest that developing countries e-waste trade practices are guided by economic and regulatory policies. Therefore, the new endogenous growth theory is more applicable to developing nations.

Table 5.19 Hypotheses and Expected Effect Size - Pre Basel Shift

	Expected Effect Size Pre Basel Shift			Actual Effect Size Pre Basel Shift			Actual Effect Size Pre Basel Shift		
Hypothesis	Combined	Developed	Developing	Combined	Developed	Developing	Combined	Developed	Developing
H1: Economic factor impact on electronic waste import volume	medium/+	medium/+	medium/+	medium/+*	medium/-	large/+*	.172*	-0.173	0.559*
H2: Political factor impact on electronic waste import volume	small/+	small/-	medium/+	small/+*	small/+	medium/+*	.115*	0.088	0.185*
H3: Environmental factor impact on electronic waste import volume	small/-	small/-	small/-	medium/-*	medium/-	small/-*	-.122*	-0.214	-0.1*
H4: The effect of the economic factor on electronic waste import volume depends on the political factor	+	+	+	-	-	+*	-0.019	-0.098	0.472*
H5: The effect of the environmental factor on electronic waste import volume depends on the political factor	-	-	-	-	-	-	-0.018	-0.029	-0.056

small ≤ .10, medium ≈ .30, large ≥ .50 positive = (+) negative = (-)

* Significant: p-value < .05

MEASUREMENT (VARIABLE) Assessment

Table 5.20 displays the expected and actual outer weights (loadings) of the indicators onto the factor. Table 5.21 outlines the variables' significance and importance. Relative importance is determined by the value of the outer weight. Then higher the value, the more important the indicator. An indicator is significant if its outer weight p-value is less than .05 and is important if it's outer weight p-value is nonsignificant, greater than .05, but its outer loading is above .50. Most variables load positively on the factor as is expected.

In all the models, as expected, GDP is the most relevant indicator to the economic construct. It is significant in the combined model and developing countries and of absolute importance in developed countries. GDP/capita is moderately important to the economic factor in the combined model. Oddly, it is of very little concern in both the developed and developing countries. The relative importance (the outer weight), is low. Additionally, it is neither significant nor of absolute importance in either country type models. This result is unexpected in that literature suggests that capital abundance plays a critical role in the economy and contributes to a country's decision to import hazardous waste.

Contrary to expectation, the percent of export of goods and services loads negatively on the economic factor in the combined and developed model. This suggests that the amount of goods and services is not relatively important to the economy. This is surprising because it is reasonable to assume that the size and health of the economy, especially in developed nations, is somewhat predicated on the extent of goods and services exported.

Polity is the most relevant indicator to the political structure in all models. It is moderately important in the combined model and in developing countries. Polity is highly important in developed countries. This is somewhat surprising because, considering developing nations have a larger range of political structures, one would expect the extent of polity would matter more in developing countries as compared to developed nations.

Although corruption is relatively low in advanced nations, it is still expected to be of concern to the political structure. Additionally, corruption is expected to be moderately important in developing countries as well. Notably, the indicator is significant in the combined and developing models.

Freedom to trade is the most critical variable to the political construct in the combined and developing models. Consequently, it is significant in these models. Freedom to trade is of low relative importance in developed countries. This is surprising because it is reasonable to assume that regulations that promote freedom to trade is critical to all types of political structures.

Environmental treaties are expected to be load positively on the environmental factor in all models. This hold true in all cases. Environmental treaties are the most important indicator in the combined and developing models and has a high relative value.[23] Alternatively, environmental treaties are not as important in developed countries. However, they are of absolute importance.

The Basel Convention was created to manage global hazardous waste trade. Therefore, it is expected that it is important to the environmental factor in all models. The convention is relatively unimportant in the combined and developing models. This is sensible because literature suggests that countries are likely to disregard the treaty. Alternatively, the Basel Convention is important in developed countries. Despite the differing relative importance, the Basel Convention is significant in both developed and developing models.

The Basel Ban Amendment prohibits developed countries from exporting hazardous waste to developing countries. Therefore, it is expected that the indicator will be important to the environmental factor in all models. Surprisingly, the amendment is of little relative importance in the combined model. It is essentially unimportant in developed nations.

[23] An indicator can be the most important to a factor because it has the highest outer weight out of all the indicators but it can be of low relative importance because the value of the outer weight is low.

However, it is moderately important and of absolute importance to the environmental factor in developing countries.

Although the importance of the environmental indicators varies between models, these results support liberal international institutionalist theory that conjecture international environmental agreements are relevant to managing the effects of global waste trade on the environment.

Table 5.20 Expected and Actual Outer Weights - Pre Basel Shift

		Expected Outer Weights			Actual Outer Weights			Actual Outer Weights		
Factor	Variable	Combined	Developed	Developing	Combined	Developed	Developing	Combined	Developed	Developing
ECONOMIC	GDP	+	+	+	+*	+	+*	0.897*	0.808	1*
	GDP /capita (US $)	+	+	+	+*	+	+	0.679*	0.059	0.069
	Export of Goods and Services	+	+	+	-*	-	+	-0.234*	-0.361	0.048
POLITICAL	Polity	+	+	+	+*	+*	+*	0.625*	0.947*	0.631*
	Corruption	+	+	+	+*	+	+*	0.47*	0.337	0.453*
	Freedom to Trade	+	+	+	+*	+	+*	0.418*	0.214	0.495*
ENVIRONMENTAL	Environmental Treaties	+	+	+	+*	+	+*	0.998*	0.296	0.822*
	Basel Convention	+	+	+	-	+*	-*	-0.188	0.901*	-0.407*
	Basel Ban Amendment	+	+	+	+	-	+*	0.095	-0.154	0.449*

positive = (+) negative = (-)

* Significant: p-value < .05

Table 5.21 Assessment of Variable Significance and Importance - Pre Basel Shift

Factor	Variable	Combined	Developed	Developing
ECONOMIC	GDP	Significant	Absolutely Important	Significant
	GDP /capita (US $)	Significant		Significant
	Export of Goods and Services	Significant		
POLITICAL	Polity	Significant	Significant	Significant
	Corruption	Significant		Significant
	Freedom to Trade	Significant		Significant
ENVIRONMENT	Environmental Treaties	Significant	Absolutely Important	Significant
	Basel Convention		Significant	
	Basel Ban Amendment			Absolutely Important

Significant: p-value < .05
Absolutely Important: p-value > .05 and outer loading weight is > .50

POST BASEL SHIFT

The post-Basel shift analysis, from 2008 to 2014, assesses 388 country-years developed and developing states, 134 and 251 respectively. In the early 2000s as globalization expanded, additional variables became important to the political economy. Innovation, tax rates and environmental protection became critically important to a nation's economic growth and trade practices. Therefore, the post Basel shift takes these variables into account. Tables 5.22 and 5.23 outline the descriptive statistics and correlation values.

Table 5.22 Descriptive Statistics - Post Basel Shift

Indicator	Mean	Median	Min	Max	Standard Deviation
Volume (tons)	11,770.81	89.20	0.00	566,820.61	48,446.95
GDP (USD millions)	575,545.69	98,266.31	349.46	17,393,103.00	1,769,167.69
GDP/capita	18,856.71	12,556.32	12,556.32	12,556.32	12,556.32
% Exports	58.78	39.34	0.00	3,264.50	177.75
Tax Rate	38.06	39.30	-99.00	117.40	23.19
Polity	1.41	8.00	-99.00	10.00	20.07
Corruption	3.81	4.30	-99.00	9.30	10.74
Trade Freedom	76.38	82.00	-99.00	95.00	22.55
Innovation	-0.62	3.69	-99.00	5.80	21.16
Enviro Treaties	3.30	3.00	0.00	9.00	1.81
Basel Entry	0.94	1.00	0.00	1.00	0.23
Ban Amend	0.50	0.00	0.00	1.00	0.50
Environmental Protection	55.64	62.90	-99.00	95.50	36.13
Population (millions)	45.98	11.13	0.09	1,295.29	135.63
Population Density	329.01	82.42	2.66	18,000.88	1,508.72

Table 5.23 Correlation - Post Basel Shift

Indicator	GDP	GDP/ capita	% Exports	Tax Rate	Polity	Corruption	Trade Freedom	Innovation	Enviro Treaties	Basel Entry	Ban Amend	EPI	Population	Population Density	Landlock
GDP	1														
GDP/ capita	0.276	1													
% Exports	-0.02	0.04	1												
Tax Rate	0.13	-0.021	-0.009	1											
Polity	0.117	0.044	-0.009	0.293	1										
Corruption	0.081	0.221	0.005	-0.004	0.032	1									
Trade Freedom	0.093	0.248	0.007	-0.088	0.249	0.267	1								
Innovation	0.083	0.171	0.019	0.01	0.252	0.377	0.45	1							
Enviro Treaties	-0.281	-0.415	-0.043	-0.141	-0.123	-0.105	-0.054	-0.035	1						
Basel Entry	-0.321	0.055	0.033	0.015	0.098	0.422	0.193	0.221	0.035	1					
Ban Amend	-0.017	0.315	-0.032	0.127	0.207	0.171	0.203	0.198	-0.07	0.156	1				
EPI	0.112	0.231	-0.017	0.208	0.209	0.134	0.342	0.294	-0.18	0.072	0.24	1			
Population	0.318	-0.094	0.007	0.159	0.089	0.012	-0.07	0.063	-0.019	-0.041	-0.125	-0.005	1		
Population Density	-0.03	0.135	0.064	0.029	-0.073	0.042	-0.186	0.04	-0.126	-0.089	-0.051	-0.081	-0.018	1	
Landlock	-0.139	-0.057	-0.024	0.012	0.054	0.021	-0.041	-0.083	0.015	-0.067	-0.024	-0.135	-0.121	-0.075	1

COMBINED MODEL

MEASUREMENT MODEL ASSESSMENT

Collinearity

Table 5.24 reports the VIF values for all the indicators. All values are between .20 and 5, hence collinearity is not an issue.

Table 5.24 Outer VIF - Post Basel Shift Combined Model

	VIF
% Exports	1.00
BanAmend	1.08
BaselEntry	1.03
Corruption	1.19
EPI	1.09
Economic * Political	1.00
Environmental * Political	1.00
GDP	1.11
GDP/Capita	1.09
Innovation	1.42
Landlock	1.00
Polity	1.10
PopDens	1.00
Population	1.00
Tax Rate	1.02
Trade Freedom	1.31
Treaties	1.04

Significance and Relevance of the Indicators

Table 5.25 outlines the weight (importance) and significance of the indicators. The percent of exports of goods and services is most critical variable to the economic factor, outer weight .931. GDP is moderately important, .340. Tax rate is slightly important to the economic factor, .132. GDP/capita is of least importance, .015. Percent of export of goods and services is

the only significant variable. Notably none of the other variables are significant nor of absolute importance.[24]

Polity and innovation are significant to the political factor. Polity is the most essential variable, .800. Innovation and corruption on slightly important, .289 and .212 respectively. Freedom to trade is the least important indicator with outer weight value .068. However, it is of absolute importance.

The number of treaties, ratification of the Ban Amendment and the environmental protection score are significant to the environmental factor. The number of treaties is the most critical variable, .761. The Ban Amendment is moderately important, .605. EPI and ratification of the Basel Entry are not critical to the environmental factor, -.345 and -.219 respectively.

[24] An indicator is absolutely important if it's outer weight p-value is nonsignificant, greater than .05, but its outer loading is above .50.

Table 5.25 Variable Results - Post Basel Shift Combined Model

Factor	Variable	Outer Weights (Outer Loadings)	t Value	p Value	Significance p value < .05
ECONOMIC	GDP	.340 (.343)	1.35	0.18	No
	GDP /capita (US $)	.015 (.144)	0.10	0.92	No
	% Export Goods and Services	.931 (.923)	2.00	0.05	Yes
	Tax Rate	.132 (.167)	1.13	0.26	No
POLITICAL	Polity	.800 (.897)	12.92	0.00	Yes
	Corruption	.212 (.365)	1.73	0.08	No
	Freedom to Trade	.068 (.454)	0.28	0.78	No
	Innovation	.289 (.601)	2.15	0.03	Yes
ENVIRONMENT	Environmental Treaties	.761 (.773)	3.09	0.00	Yes
	Basel Convention	-.219 (-.123)	1.86	0.06	No
	Basel Ban Amendment	.605 (.434)	2.91	0.00	Yes
	Environmental Protection	-.345 (-.353)	2.00	0.05	Yes

STRUCTURAL PATH MODEL ASSESSMENT (Test of Hypotheses)

Collinearity

The variance inflation factor (VIF) was assessed to determine if collinearity issues exist. Table 5.26 reports the VIF values for all the factors. All values are between .20 and 5, hence collinearity is not an issue.

Table 5.26 Inner VIF - Post Basel Shift Combined Model

	VIF
Economic	1.99
Environmental	1.04
Landlock	1.03
Pol -> Econ	2.27
Pol -> Enviro	1.19
Political	1.67
Pop Density	1.05
Population	1.05

Assessment of path coefficients

Table 5.27 reports the standardized values and significance of the path coefficients.[25] The economic factor has a medium significant effect on e-waste volume. A one-unit change in the economic factor increases import volume .371 standard deviations, 17,974 tons.[26] The political factor has little effect on volume and is insignificant. When the political factor changes one unit, volume increases .094 standard deviations, 4,554 tons. The environmental factor has a small significant effect on volume. A one-unit change in the environmental factor decreases import volume .108 standard deviations, 5,232 tons

[25] Estimated coefficients closer to +1 represent strong positive relationship.

[26] Table 8A displays the calculated estimated weight change for each model. Weight is calculated by multiplying the standard deviation of the import volume by the factor's path coefficient.

Table 5.27 Structural Path Results - Post Basel Shift Combined Model

Paths	Path Coefficients	t Value	p Value	Significance p value < .05
Economic --> Import Volume	0.371	2.03	0.04	Yes
Political Economy --> Import Volume	0.127	1.06	0.29	No
Political --> Import Volume	0.094	3.64	0.00	Yes
Political Environment --> Import Volume	-0.045	1.90	0.06	No
Environment --> Import Volume	-0.108	2.19	0.03	Yes

small ≤ .10, medium ≈ .30, large ≥ .50 positive = (+) negative = (-)

The model assumes the environmental and economic factors' effect on volume is influenced by the political factor. This model tests this interaction. Figure 5.10 demonstrates the effect size of the economic factor based on the value of the political factor. The relationship between the economic factor and volume is stronger when the value of the political factor is higher (a steeper slope when the political value is 1 standard deviation above the mean). Alternatively, the economic factor has a weaker effect when the political factor is low (a less steep slope when the political value is 1 standard deviation below the mean). In all cases, as the economic factor gets larger, import volume increases. This is an indication that regardless of the political structure, nations take advantage of the global economy of electronic waste trade.

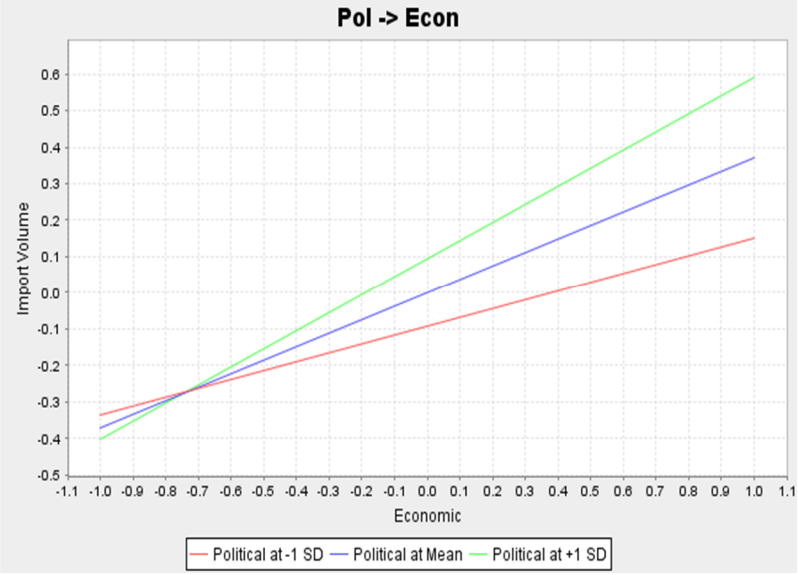

Fig. 5.10 Effect of Economic Factor Conditional on Value of Political Factor - Post Shift Combined

Figure 5.11 illustrates the effect size of the environmental factor based on the value of the political factor. The relationship between the environmental factor and volume is stronger when the value of the political factor is higher. (a steeper slope when the political value is 1 standard deviation above the mean). Alternatively, the environmental factor has a weaker effect when the political factor is low (a less steep slope when the political value is 1 standard deviation below the mean). In all 3 cases, as the environmental factor gets higher, import volume decreases. This is an indication that the political structure does not thwart the efficacy of environmental initiatives.

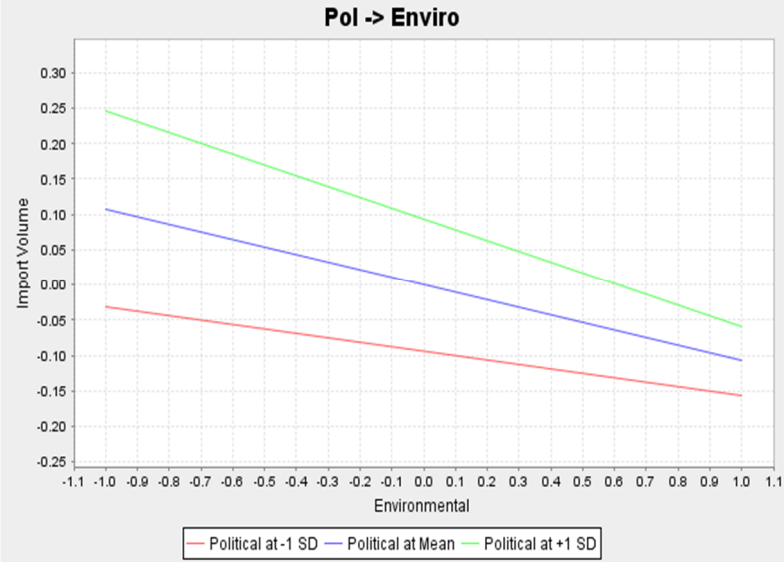

Fig. 5.11 Effect of Environmental Factor Conditional on Value of Political Factor - Post Shift Combined

Assessment of R^2 (Coefficient of Determination)

The R^2 for the combined model is .211. Economic, political and environmental factors explain approximately 21% of electronic waste importation volume when both developed and developing countries are evaluated in the same model.

Effect size of f^2

The effect size of the construct was tested to determine whether a construct has a substantive impact on the endogenous factor if it is omitted from the model.[27] The economic factor has a medium effect on volume if it was excluded from the model. All other factors have virtually no effect.[28]

[27] Hair, 201.

[28] Guidelines for f^2 values: <.02 = no effect, ~.02 = small, ~.15 = medium effect, ~.35 = large effect

Table 5.28 f^2 - Post Basel Shift Combined Model

	Import Volume
Economic	0.09
Environmental	0.01
Landlock	0.00
Pol -> Econ	0.00
Pol -> Enviro	0.00
Political	0.01
Pop Density	0.00
Population	0.00

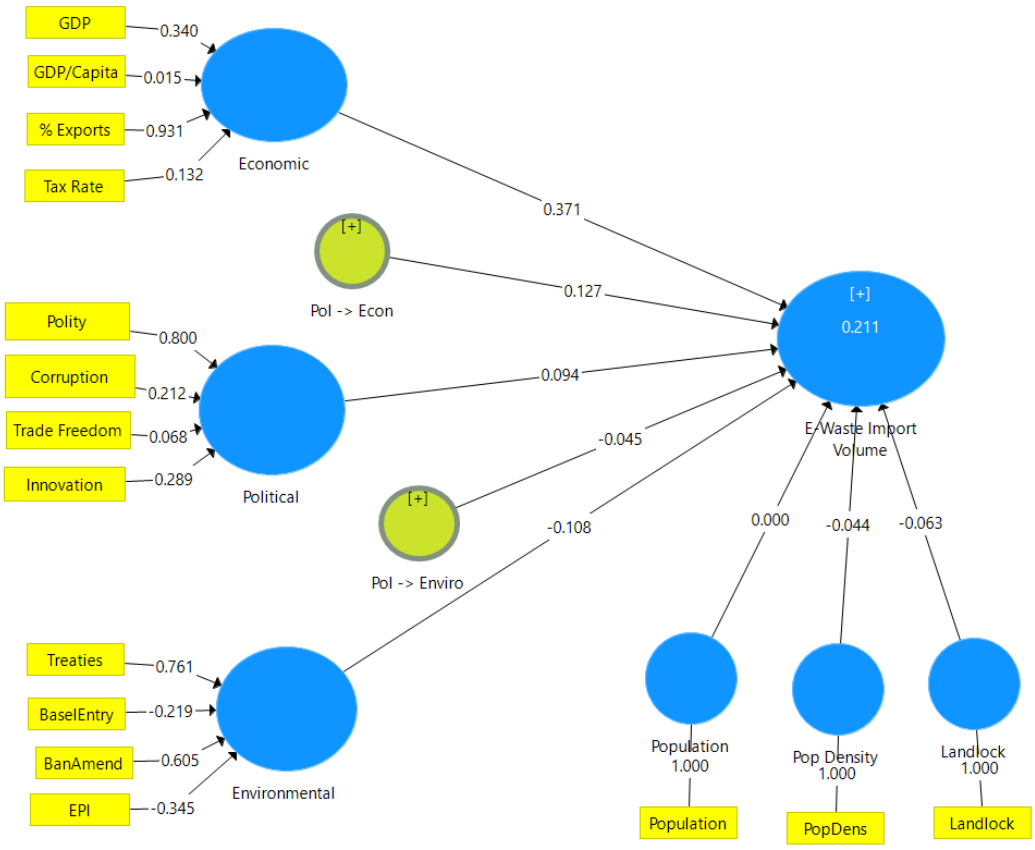

Fig. 5.12 Structural Equation Model – Post Basel Shift Combined Model

DEVELOPED MODEL

MEASUREMENT MODEL ASSESSMENT

Collinearity Issues

Table 5.29 reports the VIF values for all the indicators. All values are between .20 and 5, hence collinearity is not an issue.

Table 5.29 Outer VIF - Post Basel Shift Developed Model

	VIF
% Exports	1.38
BanAmend	1.18
BaselEntry	1.19
Corruption	1.52
EPI	1.10
Economic * Political	1.00
Environmental * Political	1.00
GDP	1.16
GDP/Capita	1.04
Innovation	1.52
Landlock	1.00
Polity	1.04
PopDens	1.00
Population	1.00
Tax Rate	1.22
Trade Freedom	1.03
Treaties	1.11

Significance and Relevance of the Indicators

Table 5.30 illustrates the significance and relevance of the indicators in the developed model. None of the economic variables are significant. However, GDP/capita and the percent of exports are of absolute importance to the economic factor. GDP/capita is the most relevant variable, .705 followed by the percent of exports, .309. The tax rate is not important to the economic factor, -.005. Additionally, GDP has very little importance to the economic factor, -.570.

Innovation is the most critical variable, .994. Polity is slightly important to the political factor, .154. Freedom to trade and corruption are not important, -.217 and -.951. None of the political variables are significant. Furthermore, only innovation is of absolute importance.

The Basel Ban Amendment and the environmental protection score are significant to the environmental factor. The Ban Amendment is the most critical indicator to the environmental factor, 1.02. The number of environmental treaties a country participates in is moderately important to the environmental factor, .239. EPI, is not important to the environmental factor, -.051. Ratification of the Basel Convention is the least relevant variable, -.181.

Table 5.30 Variable Results - Post Basel Shift Developed Model

Factor	Variable	Outer Weights (Outer Loadings)	t Value	p Value	Significance p value < .05
ECONOMIC	GDP	-.570 (-.597)	1.09	0.28	No
	GDP /capita (US $)	.705 (.678)	1.41	0.16	No
	% Export Goods and Services	.309 (.585)	1.18	0.24	No
	Tax Rate	.005 (-.240)	0.02	0.99	No
POLITICAL	Polity	.154 (-.327)	0.97	0.33	No
	Corruption	-.951 (-.430)	1.22	0.22	No
	Freedom to Trade	-.217 (.309)	0.48	0.63	No
	Innovation	-.994 (.476)	1.19	0.23	No
ENVIRONMENT	Environmental Treaties	.239 (.244)	1.00	0.32	No
	Basel Convention	-.181 (.197)	0.61	0.54	No
	Basel Ban Amendment	1.02 (.964)	2.90	0.00	Yes
	Environmental Protection	-.051 (.157)	0.15	0.88	Yes

STRUCTURAL PATH MODEL ASSESSMENT (Test of Hypotheses)

Collinearity

The VIFs for the path coefficients are between .20 and 5, indicating that no collinearity issues among the factors.

Table 5.31 Inner VIF - Post Basel Shift Developed Model

	VIF
Economic	2.62
Environmental	1.14
Landlock	1.33
Pol -> Econ	2.40
Pol -> Enviro	1.71
Political	2.67
Pop Density	1.23
Population	3.53

Assessment of path coefficients

The effect of the factors is outlined in Table 5.32. Notably, none of the direct effects are significant. The economic factor has the smallest effect on electronic waste import volume. When the economic factor changes by one unit, e-waste volume decreases .017 standard deviations, 830 tons[29], holding all other factors constant. The environmental factor and political factor have near a medium sized effect on import volume. A one- unit change in the environmental factor decreases e-waste importation by .288 standard deviations, 14,070 tons, when all other factors are held constant. When the political factor changes by one unit, e-waste volume decreases .232 standard deviations, 11,334 tons, when all other factors are held constant.

[29] Table 8A displays the calculated estimated weight change for each model. Weight is calculated by multiplying the standard deviation of the import volume by the factor's path coefficient.

Table 5.32 Structural Path Results - Post Basel Shift Developed Model

Paths	Path Coefficients	t Value	p Value	Significance p value < .05
Economic --> Import Volume	-0.017	0.13	0.89	No
Political Economy --> Import Volume	-0.028	0.19	0.85	No
Political --> Import Volume	0.255	0.90	0.37	No
Political Environment --> Import Volume	-0.232	0.80	0.43	No
Environment --> Import Volume	-0.288	1.81	0.07	No

small ≤ .10, medium ≈ .30, large ≥ .50 positive = (+) negative = (-)

Figure 5.13 demonstrates the effect size of the economic factor based on the value of the political factor. The relationship between the economic factor and volume is nearly the same when the value of the political factor is high and low (slope is the same when the political value is 1 standard deviation above and below the mean). This is an indication that the political factor does not influence the relationship between the economy and import volume.

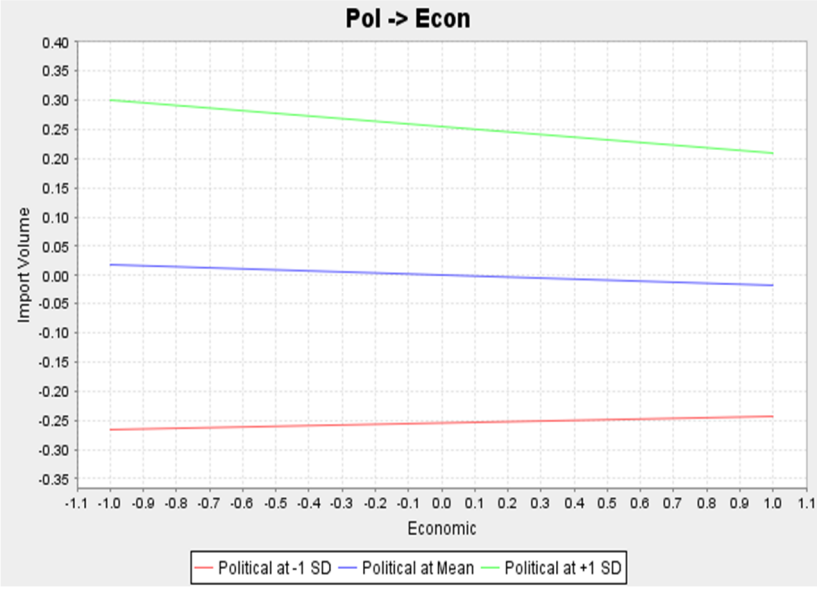

Fig. 5.13 Effect of Economic Factor Conditional on Value of Political Factor - Post Shift Developed

Figure 5.14 illustrates the effect size of the environmental factor based on the value of the political factor. The relationship between the environmental factor and volume is stronger when the value of the political factor is higher (a steeper slope when the political value is 1 standard deviation above the mean). Alternatively, the environmental factor has a weaker effect when the political factor is low (a less steep slope when the political value is 1 standard deviation below the mean). At every political value, as the environmental factor gets larger, electronic waste import volume decreases. This suggests that all political structures support environmental initiatives that seek reduce the negative consequences from importing hazardous electronic waste.

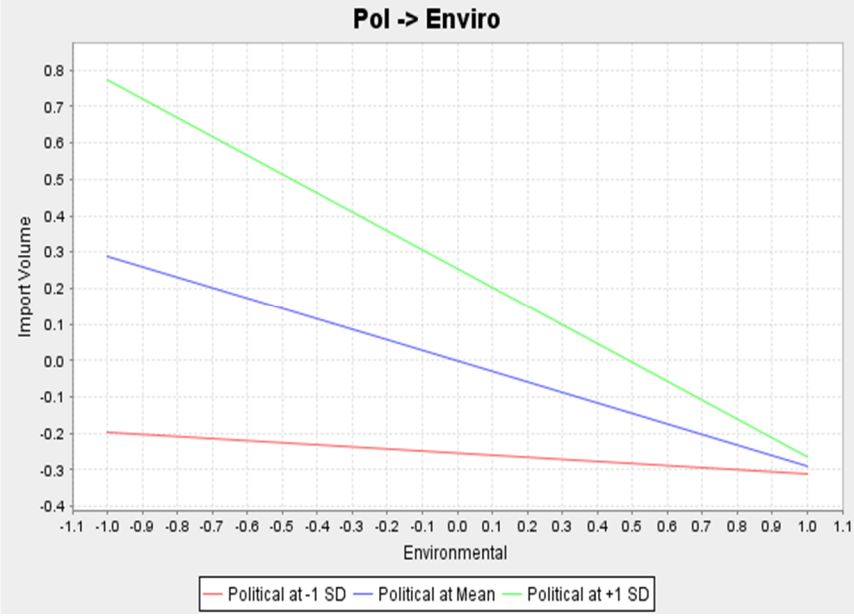

Fig. 5.14 Effect of Environmental Factor Conditional on Value of Political Factor - Post Shift Developed

Assessment of R^2 (Coefficient of Determination)

The R^2 for the developed model is .242. Economic, political and environmental factors explain 24% of electronic waste importation volume in developed countries.

Effect size of f^2

The effect size of each construct was tested to assess whether it has a substantive impact on the endogenous factor if it is omitted from the model.[30] The environmental factor will have a nearly a medium sized effect on electronic waste import volume if it is excluded from the model. The political and political environmental factors will have a small effect on electronic waste import volume if they are omitted from the analysis. All other factors will have no effect on volume if they are absent from the model.

[30] Guidelines for f^2 values: <.02 = no effect, ~.02 = small, ~.15 = medium effect, ~.35 = large effect

Table 5.33 f^2 - Post Basel Shift Developed Model

	Import Volume
Economic	0.00
Environmental	0.10
Landlock	0.01
Pol -> Econ	0.00
Pol -> Enviro	0.06
Political	0.03
Pop Density	0.01
Population	0.00

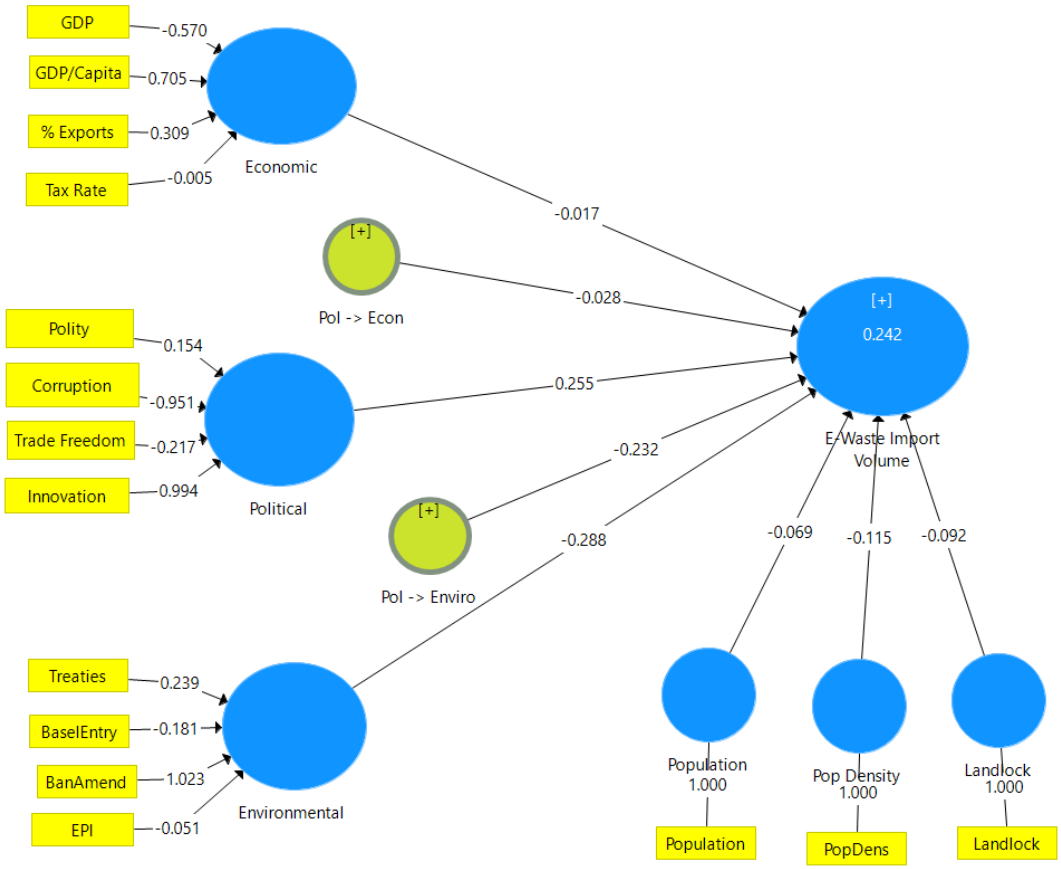

Fig. 5.15 Structural Equation Model - Post Basel Shift Developed Model

DEVELOPING MODEL

MEASUREMENT MODEL ASSESSMENT

Collinearity

The VIFs for the path coefficients are between .20 and 5, indicating that there are no collinearity issues among the indicators.

Table 5.34 Outer VIF - Post Basel Shift Developing Model

	VIF
% Exports	1.02
BanAmend	1.03
BaselEntry	1.01
Corruption	1.17
EPI	1.03
Economic * Political	1.00
Environmental * Political	1.00
GDP	1.09
GDP/Capita	1.06
Innovation	1.48
Landlock	1.00
Polity	1.24
PopDens	1.00
Population	1.00
Tax Rate	1.09
Trade Freedom	1.40
Treaties	1.01

Significance and Relevance of the Indicators

Table 5.35 outlines the significance and relevance of the indicators in the developing model. The percent of goods and services exported is the only significant variable and is the most critical variable to the economic factor, .838. GDP is moderately important, .448 and is of absolute importance. Tax rate is essentially irrelevant, -.001. GDP/capita is also not important to the economic factor, -.037.

All of the political indicators are significant to the factor. Polity is the most relevant variable, .734. Freedom to trade is moderately important, .310. Innovation is of absolute importance to the political factor.[31] Corruption is the least critical variable to the political factor, .066.

Environmental treaties and ratifying the Basel Ban Amendment are significant indicators to the environmental factor. The number of treaties a country participates in the most important variable, .721. The Ban Amendment is of moderate importance, .598. Although participating in the Basel Convention is significant it is not important to the environmental factor, -.218. Additionally, the environmental protection score is of little contribution to the environmental factor, -.255.

[31] The variable is not significant but its outer loading is above .50 which makes it of absolute importance.

Table 5.35 Variable Results - Post Basel Shift Developing Model

Factor	Variable	Outer Weights (Outer Loadings)	t Value	p Value	Significance p value < .05
ECONOMIC	GDP	.448 (.558)	1.32	0.19	No
	GDP /capita (US $)	-.037 (.050)	0.76	0.44	No
	% Export Goods and Services	.838 (.897)	1.94	0.05	Yes
	Tax Rate	.001 (.130)	0.03	0.97	No
POLITICAL	Polity	.734 (.519)	4.94	0.00	Yes
	Corruption	.066 (.223)	0.42	0.68	No
	Freedom to Trade	.310 (.684)	0.89	0.37	No
	Innovation	.174 (.598)	0.90	0.37	No
ENVIRONMENT	Environmental Treaties	.721 (.768)	4.33	0.00	Yes
	Basel Convention	-.218 (-.211)	2.09	0.04	Yes
	Basel Ban Amendment	.598 (.569)	3.46	0.00	Yes
	Environmental Protection	-.255 (-.238)	1.09	0.27	No

STRUCTURAL PATH MODEL ASSESSMENT (Test of Hypotheses)

Collinearity

The inner VIFs were assessed to determine if collinearity exists. Collinearity issues are present in the economic and political economic factor. This issue is resolved when the political economic factor is omitted from the model.[32]

Table 5.36 Inner VIF - Post Basel Shift Developing Model

	VIF
Economic	7.05
Environmental	1.05
Landlock	1.07
Pol -> Econ	8.66
Pol -> Enviro	1.20
Political	3.78
Pop Density	1.04
Population	1.16

Assessment of path coefficients

Notably none of the factors are significant. The economic and environmental factors have a small effect. When the economic factor changes by one unit, e-waste volume increases .105 standard deviations, 4,992 tons[33], holding all other factors constant. A one- unit change in the environmental factor decreases volume .095 standard deviations, 4,517 tons. The political factor has a medium size effect on e-waste import volume. When the political factor changes by one unit, e-waste volume increases .372 standard deviations, 17,688 tons.

[32] Inner VIF for economic factor becomes 1.05.

[33] Table 8A displays the calculated estimated weight change for each model. Weight is calculated by multiplying the standard deviation of the import volume by the factor's path coefficient.

Table 5.37 Structural Path Results - Post Basel Shift Developing Model

Paths	Path Coefficients	t Value	p Value	Significance p value < .05
Economic --> Import Volume	0.105	0.30	0.76	No
Political Economy --> Import Volume	1.343	1.69	0.09	No
Political --> Import Volume	0.372	1.15	0.25	No
Political Environment --> Import Volume	-0.070	1.49	0.14	No
Environment --> Import Volume	-0.095	1.79	0.07	No

small ≤ .10, medium ≈ .30, large ≥ .50 positive = (+) negative = (-)

Figure 5.16 demonstrates the effect size of the economic factor based on the value of the political factor. The relationship between the economic factor and volume is equally strong when the value of the political factor is high and low (a steep slope when the political value is 1 standard deviation above and below the mean). This is an indication that the economic factor's effect on volume is strong in both more democratic developing countries as well as in authoritarian developing nations. However, the extent of e-waste import volume varies based on the political value. Volume decreases as the economic factor gets larger countries with lower political values. This is likely because these countries have less freedom to trade and innovation which limit their competitiveness in the global market. Conversely, nations with a higher political value (more democratic, more openness to trade and regulations that promote innovation) take advantage of the global economy.

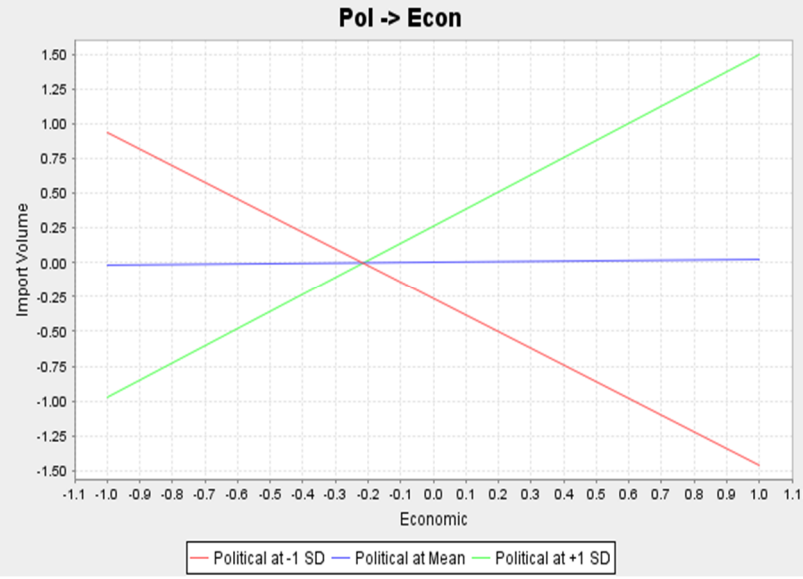

Fig. 5.16 Effect of Economic Factor Conditional on Value of Political Factor - Post Shift Developing

Figure 5.17 illustrates the effect size of the environmental factor based on the value of the political factor. The environmental factor has a strong relationship with import volume when the political value is high (a steeper slope when the political value is 1 standard deviation above the mean). Furthermore, volume decreases, as the environmental factor gets larger. Hence, this is an indication that although these countries are likely to have more variables that promote an increase e-waste importation (more openness to trade, higher investment in technology and innovation) they do not do so. This result indicates that environmental initiatives are not outweighed by political variables. Conversely, the environmental factor has no effect on volume among countries with a low political value (no slope).

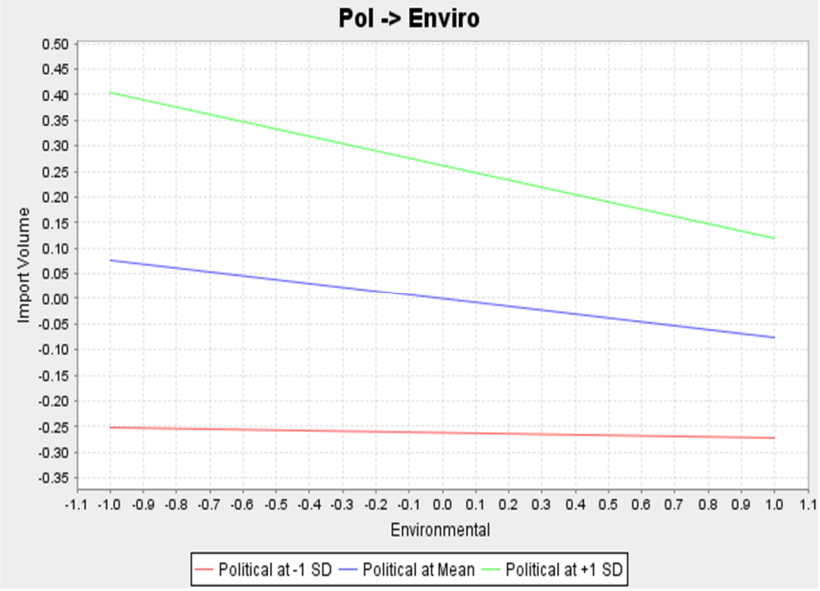

Fig. 5.17 Effect of Environmental Factor Conditional on Value of Political Factor - Post Shift Developing

Assessment of R^2 (Coefficient of Determination)

The R^2 for the developing model is .394. Approximately 39% of electronic waste importation volume in developing countries can be explained by economic, political and environmental factors.

Effect size of f^2

The effect size of each construct was tested to assess whether it has a substantive impact on the endogenous factor if it is omitted from the model.[34] Excluding the political economic and political factors from the model will have a small to medium impact on e-waste import volume, all other factors will have no effect on electronic waste import volume if they are absent from the model.

[34] Guidelines for f^2 values: <.02 = no effect, ~.02 = small, ~.15 = medium effect, ~.35 = large effect

Table 5.38 f^2 - Post Basel Shift Developing Model

	Import Volume
Economic	0.00
Environmental	0.01
Landlock	0.00
Pol -> Econ	0.07
Pol -> Enviro	0.01
Political	0.06
Pop Density	0.00
Population	0.01

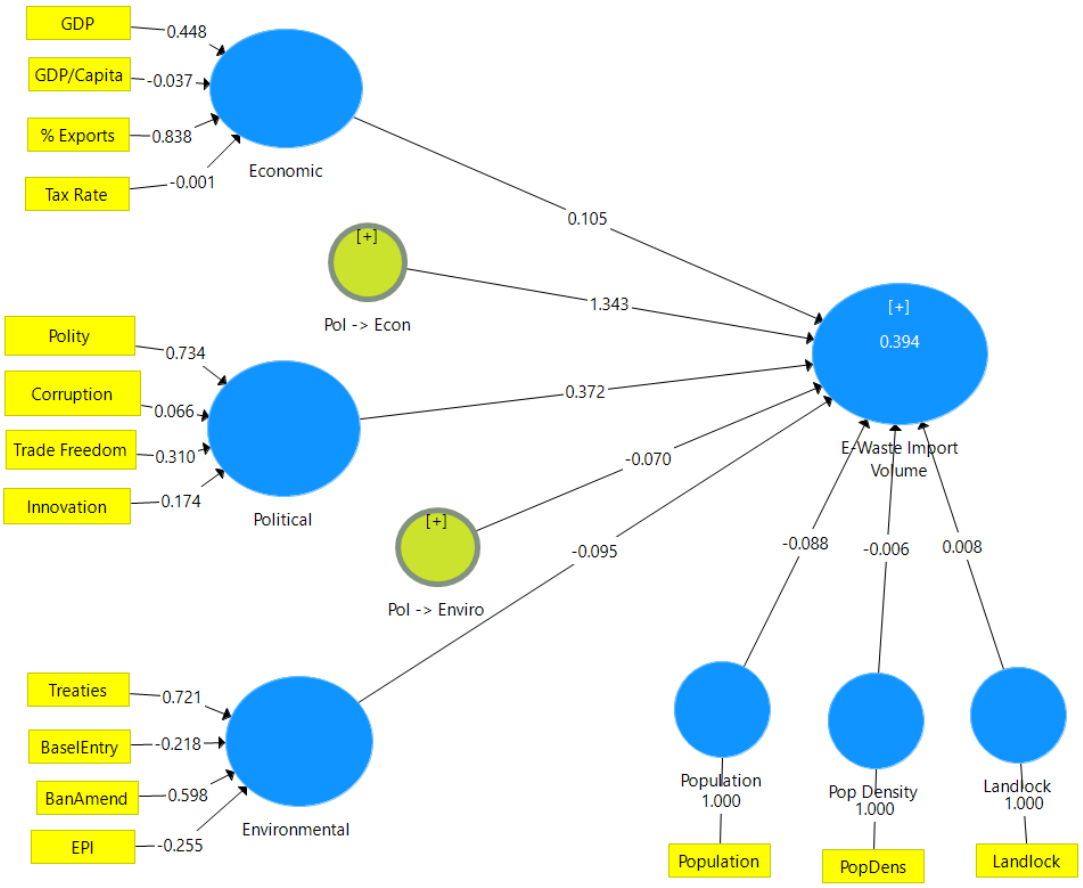

Fig. 5.18 Structural Equation Model - Post Basel Shift Developing Model

POST BASEL SHIFT FINDINGS AND THEORETICAL IMPLICATIONS

STRUCTURAL (FACTOR) ASSESSMENT

The results of the study indicate that economic, political and environmental factors better explain electronic waste import volume practices when country types are modeled independently, 24% in developed and approximately 39% in developing countries, versus 21% when country types are modeled jointly.

Table 5.39 outlines the factors' significance and expected/actual effect sizes within each model. The findings indicate that developed and developing countries import volume are driven by different factors. E-waste import volume in developed countries is almost equally influenced by the political and environmental factors. Therefore, environmental political theory best explains effects on waste importation practices in developed countries. Conversely, the political economic factor is the most impactful factor in developing countries. Accordingly, the new endogenous growth theory explains waste trade in developing countries.

The economic factor is expected to have a medium positive effect on volume in all models. This hypothesis is realized in the combined model. Additionally, in the combined model, the economic factor has the largest impact on e-waste volume. However, when country types are evaluated individually the economic factor has a small, negative effect on volume in developed countries and a small positive effect on volume in developing nations. Consequently, this study demonstrates that the economic nationalist perspective, the belief that the state of a nation's economy, is most applicable when country types are modeled together. Also, the small effect size of the economic factor in the individual country models illustrate that the economic factor is not as important as literature surmises. This finding is especially important to proponents of the North to South Theory and Pollution/Waste Haven hypotheses who conjecture that less developed countries are mainly motivated to import waste because of economic reasons.

It is hypothesized that the political factor will have a small positive effect on import volume in all models. When the country types are modeled together, the political factor slightly increases volume. However, when developed and developing countries are assessed individually the political factor has a medium sized effect on import volume. Although the political factor is not the primary driver of waste in either country types, its effect size is larger than hypothesized. This gives some support to the domestic institutionalist position that the political and regulatory structure of a nation is an important factor to hazardous waste import volume.

This analysis assumes that environmental initiatives are effective in reducing hazardous e-waste import volume. Therefore, the environmental factor is expected to have a small negative effect on e-waste import volume in all models. The results indicate that this is true. The environmental factor slightly decreases e-waste import volume in all the models. This outcome provides evidence that international environmental agreements are effective in reducing e-waste import volume. The results are particularly important for developing nations because literature suggests that developing nations are more likely to suffer from environmental hazards. It is worth mentioning that the environmental factor is significant only when country types are modeled jointly.

It is expected that volume will increase when the political factor moderates on the relationship between the economic factor and volume. The hypothesis is partially realized when country types are modeled together. Volume increases as the economic factor gets larger. However, the hypothesis is rejected in both developed and developing nations. Interestingly, in developed countries, the political economic factor's effect size is inconsequential (has virtually no effect) and is not significant on e-waste import volume. Additionally, volume remains relatively flat at all political values (no slope of line).[35] In developing nations, the relationship

[35] Refer to developed countries' post Basel shift economic interaction plots.

between the economic factor and e-waste import volume is strong when the political factor is high and low. However, contrary to the hypothesis volume decreases when the political factor is low. Despite this effect, the political economic factor is the most impactful factor in developing countries. This suggests that the new economic growth explains electronic waste importation practices in developing countries.

The analysis also tests the interaction between the domestic political factor's influence on the relationship between the environmental factor and e-waste import volume. The assumption is that the political structure will not hinder environmental initiatives. Therefore, in all models, it is hypothesized that e-waste volume will decrease when the political factor moderates on the relationship between the environmental factor and e-waste volume. This holds true in all models. As the environmental factor gets larger electronic waste import volume decreases.[36] This finding is important because it refutes the race to the bottom and waste haven hypothesis that conjecture states, in particular developing countries, create lax regulations to import electronic waste.

[36] Refer to combined model and developing countries' post Basel shift environmental interaction plots.

Table 5.39 Hypotheses and Expected Effect Size - Post Basel Shift

	Expected Effect Size Post Basel Shift			Actual Effect Size Post Basel Shift			Actual Effect Size Post Basel Shift		
Hypothesis	Combined	Developed	Developing	Combined	Developed	Developing	Combined	Developed	Developing
H1: Economic factor impact on electronic waste import volume	medium/+	medium/+	medium/+	medium/+*	small/-	small/+	0.371*	-0.017	0.105
H2: Political factor impact on electronic waste import volume	small/+	small/+	small/+	small/+*	medium/+	medium/+	0.094*	0.255	0.372
H3: Environmental factor impact on electronic waste import volume	small/-	small/-	small/-	small/-*	medium/-	small/-	-0.108*	-0.288	-0.095
H4: The effect of the economic factor on electronic waste import volume depends on the political factor	+	+	+	+	-	+	0.127	-0.028	1.343
H5: The effect of the environmental factor on electronic waste import volume depends on the political factor	-	-	-	-	-	-	-0.045	-0.232	-0.07

small ≤ .10, medium ≈ .30, large ≥ .50 positive = (+) negative = (-)

* Factor is significant. P value < .05

MEASUREMENT (VARIABLE) ASSESSMENT

Table 5.40 displays the expected and actual outer weights (loadings) of the indicators onto the factor. Relative importance is determined by the value of the outer weight. Table 5.41 outlines the variables' significance and importance. An indicator is significant if its outer weight p-value is less than .05 and is absolutely important if it's outer weight p-value is non-significant, greater than .05, but its outer loading is above .50.

GDP and GDP/capita function as expected in the combined model. However, they do not load as expected when country types are evaluated separately. In advanced countries, GDP loads negatively and GDP/capita loads positively. Conversely, GDP is positive in developing countries and GDP/capita is negative. These results support studies that illustrate capital abundance (individual wealth) and the size (wealth) of the economy are important variables to the economic factor. However, they also reveal that the importance of these economic variables differs between country types. In developed nations, GDP/capita is the most important indicator to the factor and is absolutely important. GDP is irrelevant in developed countries. Alternatively, GDP is important in developing nations and GDP/capita is immaterial. Interestingly, GDP is not significant to the economic factor in the developing model.

The percent of goods and services exported is positive in all models. However, the relative importance differs. When country types are modeled jointly and in developing countries, export matters substantially. However, the percent of exports is not nearly as important in developed nations. This finding provides additional evidence that the size of the economy matters more to the economic factor in developing countries than developed. Notably, the percent of goods and services is significant in the combined and developed models.

Scholars and practitioners argue that corporate tax rates impact trade and economic/industry development of the waste management industry. Therefore, it is expected to be relatively important in all models. The tax rate is slightly important to the economic factor in the combined model. It is nearly irrelevant to the economic factor in developed and developing

nations. This is especially interesting because literature suggests that tax rates are especially concerning to advanced nations because rates are generally higher in developed nations which prohibits economic growth. More so, tax rate is not significant in any model.

Polity is hypothesized to be important to the political factor in all the models. This holds true. Nonetheless the relative importance differs between country types. Polity is highly important in the combined and developed model. Accordingly, it is significant in these models. Polity is slightly important in the developed model. Polity being of greater relevance in the developing model is to be expected considering the variation of political structures in developing nations.

It is expected that corruption is of concern in all models. However, corruption is immaterial to the political factor when country types are modeled independently. Corruption loads negatively and is not important in developed nations. It loads positively in developing nations but is essentially irrelevant. It is not surprising that corruption is not as important in developed nations because some literature suggests that corruption is not as prevalent in developed nations as compared to developing nations. However, because of corruption appears to be more prevalent in less developed nations it is surprising that corruption is not important to the political factor.

Freedom to trade is expected to have a positive impact on the political factor. Freedom to trade is of little importance when the country types are combined. It is also not important to the political factor in developed nations. Freedom to trade is moderately in developing nations.

Innovation policies are assumed to be important to the political factor as it relates to e-waste trade. Innovation is moderately important in the combined model. It is the most relevant indicator in the developed model. Innovation is also slightly important in developing countries.

This outcome supports literature that contends that developing countries are concerned about technological advancements that are necessary to compete in the global economy.[37]

Environmental treaties is the most important indicator to the environmental factor in the combined and developing models. Accordingly, they are significant in these models. However, environmental treaties are of moderate importance in the developed model. Interestingly, environmental treaties are more important in developing nations than the Basel Ban Amendment which was created to safeguard it against hazardous waste.

Nonetheless, the Ban Amendment is important in all the models. It is the most relevant to the environmental factor in developed nations. Additionally, it is of high importance to the environmental factor in the combined and developing model. Notably, the Basel Amendment is significant in all the models. Alternatively, ratifying the Basel Convention is inconsequential in all models.

The environmental protection score is expected to be of importance in all models. Oddly, it is not important in any of the models.

[37] Discussed in the Global Innovation Index (2015).

Table 5.40 Expected and Actual Outer Weights - Post Basel Shift

		Expected Outer Weights			Actual Outer Weights			Actual Outer Weights		
Factor	Variable	Combined	Developed	Developing	Combined	Developed	Developing	Combined	Developed	Developing
ECONOMIC	GDP	+	+	+	+	-	+	0.340	-0.570	0.448
	GDP /capita (US $)	+	+	+	+	+	-	0.015	0.705	-0.037
	Export of Goods and Services	+	+	+	+*	+	+*	0.931*	0.309	0.838*
	Tax Rate	+	+	+	+	-	-	0.132	-0.005	-0.001
POLITICAL	Polity	+	+	+	+*	+	+*	0.8*	0.154	0.734*
	Corruption	+	+	+	+	-	+	0.212	-0.951	0.066
	Freedom to Trade	+	+	+	+	-	+	0.068	-0.217	0.310
	Innovation	+	+	+	+	+	+	0.289	0.994	0.174
ENVIRONMENTAL	Environmental Treaties	+	+	+	+*	+	+*	0.761*	0.239	0.721*
	Basel Convention	+	+	+	-	-	-*	-0.219	-0.181	-0.218*
	Basel Ban Amendment	+	+	+	+*	+*	+*	0.605*	1.023*	0.598*
	Environmental Protection Index	+	+	+	-	-*	-	-0.345*	-0.051*	-0.255

positive = (+) negative = (-)

* Significant: p-value < .05

Table 5.41 Assessment of Variable Significance and Importance - Post Basel Shift

Factor	Variable	Combined	Developed	Developing
ECONOMIC	GDP			Absolutely Important
	GDP /capita (US $)		Absolutely Important	
	Export of Goods and Services	Significant	Absolutely Important	Significant
	Tax Rate			
POLITICAL	Polity	Significant		Significant
	Corruption			
	Freedom to Trade			Absolutely Important
	Innovation	Significant	Absolutely Important	Absolutely Important
ENVIRONMENT	Environmental Treaties	Significant		Significant
	Basel Convention			Significant
	Basel Ban Amendment	Significant	Significant	Significant
	Environmental Protection Index	Significant	Significant	

Significant: p-value < .05

Absolutely Important: p-value > .05 and outer loading weight is > .50

PRE & POST BASEL SHIFT FINDINGS AND THEORETICAL IMPLICATIONS

In 2008 Basel repositioned its view on waste from a value less by product to a profitable commodity. This analysis tests whether this change altered nations' economic, political and environmental factors impact on hazardous electronic waste import volume. The study finds that there is a sizeable explanation change pre to post shift in the combined and developed models, approximately 10% to 21% and approximately 11% to 24%, respectively. Hence, economic, political and environmental factors better explain electronic waste trade import practices post Basel shift.

Table 5.42 R^2 - Pre and Post Basel Shift

Model	Pre Basel	Post Basel
Combined	10.2	21.1
Developed	11.4	24.2
Developing	38	39.4

STRUCTURAL (FACTOR) ASSESSMENT

Table 5.43 displays the theories that best explain what drives waste import volume before and after Basel shifted its view on waste. The economic nationalist theory, the notion that economic variables drive a nation's propensity to import electronic waste, explains waste trade importation practices in the combined model before and after Basel shifted its view on waste. The economic nationalist perspective theory explains waste import volume in the developing model waste import volume pre Basel shift. However, post shift the new endogenous growth theory better explains waste import practices in developing countries. Lastly, tenets of neoliberal international institutionalism best explain waste import behavior in

developed countries pre Basel shift. After the shift, developed countries' import volume is best explained by environmental political theory.

Table 5.43 Theory Explanation - Pre and Post Basel Shift

Model	Pre Basel Shift	Post Basel Shift
Combined	Economic Nationalist/ Neoclassical Economic Theory	Economic Nationalist/ Neoclassical Economic Theory
Developed	Neoliberal International Institutionalism	Environmental Political Theory
Developing	Economic Nationalist/ Neoclassical Economic Theory	New Endogenous Growth Theory

In developing countries, the primary influencer of electronic waste import volume changes from the economic factor pre Basel shift to the political economic factor after Basel changes its perspective on waste. This change demonstrates that the political structure plays a larger role with e-waste import practices after the shift. Additionally, the directionality of e-waste differs pre and post shift when the political factor moderates on the relationship between the economic factor and e-waste import volume.[38] Before Basel altered its view on waste, all developing nations regardless of their political structure import more electronic waste as the economic factor gets larger. Conversely, after the shift, waste import volume increases only in developing countries that are more democratic, are more open to trade and have higher levels of innovation. Alternatively, countries that are less open to trade and less democratic (low political value) import volume decreases as the economic factor gets larger. This suggests that Basel's shift on waste did not alter the behavior of developing countries that already had the ability to participate in the global economy. However, it is possible that Basel's change shifted

[38] Refer to developing countries' economic interaction plots.

volume to developing nations who are already competitive in the market thereby reducing less developed countries ability to import waste. Therefore, regarding electronic waste trade, it is unlikely that Basel shifting its view induces a 'race to the bottom' in which states alter regulatory parameters to import electronic waste and maximize economic benefits.

Basel altering its perspective on waste did not change the importation practices of developing countries when the political factor moderates on the relationship between the environment and e-waste import volume.[39] Notably, e-waste volume decreases more among countries with higher political values (more freedom to trade and more democratic). Nonetheless, import volume decreases in developing nations at all political levels (countries with more and less freedom to trade and more and less democratic) pre and post Basel shift. Hence, these results rebut literature that suggest the Basel shift causes a 'race to the bottom' among developing nations.

In developed countries before Basel shifted its view on waste the environmental factor is the key driver on e-waste import volume. Hence, liberal international institutionalism explains e-waste trade practices. The environmental factor continues to be the primary driver post Basel shift. However, the political and political environmental factors become equally as strong. This suggests that post Basel shift the government plays a larger role in electronic waste importation thus, e-waste trade practices are better explained by tenets of environmental political theory. This is not surprising because environmental awareness continues to be of growing concern among society and states. Consequently, it is understandable that import volume decreases during pre and post Basel time periods at all political levels when the political factor moderates on the relationship between the environmental factor and volume.[40] Notably, volume experiences a sharper decline during the post Basel period when the political factor moderates on the relationship between the environmental factor and volume (a steeper slope of the line).

[39] Refer to developing countries' environmental interaction plots.

[40] Refer to developed countries' environmental interaction plots.

E-waste volume changes in developed countries when the political factor moderates on the relationship between the economic factor and volume after Basel shifted its view.[41] Pre shift, when the political factor moderates on the relationship between the economic factor volume decreases at all political levels. However, after the shift, volume remains relatively flat and does not affect e-waste import volume. This suggests that post shift, developed countries do not create political economic regulations that induce electronic waste importation.

The political factor increases volume pre and post Basel shift in both developed and developing countries. However, in both country types, the factor becomes more important in e-waste volume after Basel altered its view on waste. This suggests that after the shift, the political structure plays a larger role in enabling nations to import electronic waste. The growth in the importance of the political factor gives credence to scholars that the shift will cause countries to alter policies to increase import volume. This change also gives merit to domestic institutionalist theory that contends a nation's political structure determines the extent to which a county imports hazardous waste. However, the domestic political structure is not as impactful as both groups argue.

There are generally two arguments relating to the environmental factor. Some scholars argue that despite the shift the increase in environmental awareness leads to international environmental agreements which will decrease hazardous waste import volume. Another perspective is that this effect is more likely in developed countries as compared to developing nations because developing nations are not as environmentally conscious. The results indicate that the environmental factor moderately reduces import volume in developed countries before and after the shift. Additionally, the environmental factor causes a small decrease in electronic waste import volume before and after Basel changes in developing countries. This outcome validates international institutionalist that argue outputs of international institutions, such as

[41] Refer to developed countries' economic interaction plots.

international environmental agreements, are effective in minimizing negative consequences stemming from trade.

Table 5.44 Hypotheses and Actual Effect Size - Pre and Post Basel Shift

Hypothesis	Actual Effect Size Pre Basel Shift			Actual Effect Size Post Basel Shift		
	Combined	Developed	Developing	Combined	Developed	Developing
H1: Economic factor impact on electronic waste import volume	medium/+*	medium/-	large/+*	medium/+*	small/-	small/+
H2: Political factor impact on electronic waste import volume	small/+*	small/+	medium/+*	small/+*	medium/+	medium/+
H3: Environmental factor impact on electronic waste import volume	medium/-*	medium/-	small/-*	small/-*	medium/-	small/-
H4: The effect of the economic factor on electronic waste import volume depends on the political factor	-	-	+*	+	-	+
H5: The effect of the environmental factor on electronic waste import volume depends on the political factor	-	-	-	-	-	-

small ≤ .10, medium ≈ .30, large ≥ .50 positive = (+) negative = (-)

* Significant: p-value < .05

MEASUREMENT (VARIABLE) ASSESSMENT

The findings illustrate that the importance of variables changed after Basel shifted its view on waste. Table 5.45 outlines the actual outer weights of the variables pre and post the Basel shift.

Prior to the shift, GDP is the most important variable to the economic factor in all the models. However, after the repositioning GDP/capita is the most important indicator to the economic factor in developed countries and the percent of exports of goods and services becomes the most critical variable in the combined and developing models. This change is understandable in that the percent of goods and services is a measure of a country's level of participation in the global economy. Therefore, it is likely that this variable is extremely important to developing countries that import waste as a means of participating in global trade.

During the pre-shift period, polity is the most important variable to the political factor in all the models. Polity remains the most critical variable after the shift in the combined and developing models. Innovation becomes the most critical variable in the developed model after Basel changed its perspective on waste. This change is not surprising in that enhancements in that richer countries are more likely to have the desire and capital to invest in technology and innovation to maximize profits. It is worth noting that corruption and freedom to trade become less important after the shift.

Environmental treaties is the most relevant indicator to the environmental factor in the combined and developing models pre and post Basel adjusting its view on waste. The Basel Convention is the most critical factor in developed countries pre shift. This changes in the post shift period. The Ban Amendment becomes the most important variable. This change is interesting because once Basel decided that waste is a resource it is unlikely that developed nations with equipment and capital that permits them to extract the valuable components from electronic waste will have a desire to export the commodity.

Table 5.45 Actual Outer Weights - Pre and Post Basel Shift

		Pre Basel Shift			Post Basel Shift		
Factor	Variable	Combined	Developed	Developing	Combined	Developed	Developing
ECONOMIC	GDP	0.897*	0.808	1*	0.34	-0.57	0.448
	GDP /capita (US $)	0.679*	0.059	0.069	0.015	0.705	-0.037
	Export of Goods and Services	-0.234*	-0.361	0.048	0.931*	0.309	0.838*
	Tax Rate				0.132	-0.005	-0.001
POLITICAL	Polity	0.625*	0.947*	0.631*	0.8*	0.154	0.734*
	Corruption	0.47*	0.337	0.453*	0.212	-0.951	0.066
	Freedom to Trade	0.418*	0.214	0.495*	0.068	-0.217	0.31
	Innovation				0.289	0.994	0.174
ENVIRONMENTAL	Environmental Treaties	0.998*	0.296	0.822*	0.761*	0.239	0.721*
	Basel Convention	-0.188	0.901*	-0.407*	-0.219	-0.181	-0.218*
	Basel Ban Amendment	0.095	-0.154	0.449*	0.605*	1.023*	0.598*
	Environmental Protection Index				-0.345*	-0.051*	-0.255

positive = (+) negative = (-)

* Significant: p-value < .05

CHAPTER 6

CONCLUSION: WASTE NOT…WANT NOT

There are generally five theories that explain hazardous waste trade. The economic nationalist perspective posits that economic variables promote a country to import waste. The domestic institutionalist theory argues that the domestic political structure is the leading determinant of waste import volume. The new endogenous growth theory asserts that a combination of regulations and economic variables influence waste import volume. Neoliberal international institutionalism contends that international environmental initiatives influence waste volume. Lastly, environmental political theory argues that environmental and political factors impact waste import volume.

The overarching purposes of this study are first to identify factors that influence state behavior in waste importation and secondly to determine which factor has the largest effect on import volume. In doing so, the project identifies which theory best explains what drives countries to import electronic waste.

As to be expected, the results reveal that one theory does not explain waste import volume. In fact, different theories explain waste import volume when country types are modeled independently versus when modeled jointly. The findings also illustrate that the impact of factors changes over time. These changes represent the evolving nature of the political economy of hazardous electronic waste trade.

OVERALL MODEL

The overall model assesses electronic waste import volume from 1998 – 2014. The economic factor has the largest effect on electronic waste volume in the combined model. Therefore, the economic nationalist perspective best explains waste importation in the combined model. Following this result, the economic status drives e-waste import volume. Alternatively, the political economic factor has the largest effect on import volume in developed and developing countries. Consequently, the new growth theory best explains what drives waste importation in both developed and developing countries. This suggests that the government's impact on the economic factor plays a large role in hazardous waste import volume.

Table 6.1 shows the hypotheses results for the overall model.[1] Hypotheses 1a-c is that the economic factor has a large positive impact on electronic waste import volume. These hypotheses are partially accepted in the combined and developing model. Although the effect small is smaller than what is hypothesized, volume increases as expected. The hypothesis is rejected in the developed model. The economic factor has a medium sized effect and decreases volume.

Hypotheses 2a-c state the political factor has a medium positive impact on electronic waste import volume. The hypothesis is true in developing countries. The hypothesis is partially accepted in the combined model. In this model, the political factor has a small effect on e-waste import volume. However, aligning with the hypothesis, the political factor increases volume. The hypothesis is rejected in the developed model. The effect of the political factor is smaller than what is hypothesized and e-waste import volume decreases.

Hypotheses 3a-c posit that the environmental factor has a small negative effect on electronic waste import volume. The hypotheses are accepted in all models.

[1] Refer to Chapter 4.

Hypotheses 4a-c assume expects the economic factor's effect on e-waste import volume will be stronger when the political value is lower. It also assumes that the economic factor increases volume. The hypothesis is partially accepted in all the models. In the combined model, as the economic factor gets larger, volume increases at all political values. However, the economic effect size does not get change because of the political factor values. In the developed model, the economic factor's effect is stronger when the political value is low. However, e-waste import volume decreases. In developing countries, the relationship between the economic factor and e-waste import volume is equally strong among politically high and low countries. Additionally, import volume increases only among politically high leveled developing countries.

Hypotheses 5a-c conjectures that the influence of the political factor causes the environmental factor to decrease volume. It also expects that the environmental factor will have a stronger relationship on volume when the value of the political factor is higher. The hypotheses are accepted in all the models. Additionally, the political environmental factor decreases electronic waste volume in all models.

Table 6.1 Hypotheses with Expected and Actual Factor Effects

	Expected Effect Size			Actual Effect Size			Actual Effect Size		
Hypothesis	Combined	Developed	Developing	Combined	Developed	Developing	Combined	Developed	Developing
H1: Economic factor impact on electronic waste import volume	large/+	large/+	large/+	medium/+*	medium/-	medium/+	~	✗	~
H2: Political factor impact on electronic waste import volume	medium/+	medium/+	medium/+	small/+*	small/-	medium/+*	~	✗	✓
H3: Environmental factor impact on electronic waste import volume	small/ -	small/ -	small/ -	small/-*	small/-	small/-*	✓	✓	✓
H4: The effect of the economic factor on electronic waste import volume depends on the political factor	+	+	+	+	-	-*	~	~	~
H5: The effect of the environmental factor on electronic waste import volume depends on the political factor	-	-	-	-	-	-	✓	✓	✓

small ≤ .10, medium ≈ .30, large ≥ .50 positive = (+) negative = (-) ✓ accept ~ partial acceptance ✗ reject

* Significant: p value < .05

PRE & POST BASEL SHIFT

The pre and post Basel shift analyses evaluate whether Basel shifting its view on waste from a value less by-product to a profitable commodity altered a factor's effect on electronic waste import volume. The pre Basel shift analysis evaluates electronic waste import data from 1998 to 2006. The post Basel analysis evaluates 2008 to 2014.

In the combined model, the economic factor is the largest influencer pre and post Basel changing its position on waste. Therefore, the economic nationalist theory, the assertion that economic variables drive a nation's propensity to import electronic waste, explains electronic waste importation practices when country types are modeled jointly. However, combining country types blends the effects of developed and developing countries. Evaluating country types independently yields a more fruitful analysis.

Neoliberal international institutionalism best explains waste import behavior in developed countries pre Basel shift. However, after the shift, import volume in developed countries is almost equally explained by the neoliberal institutionalism, domestic institutionalism and environmental political theory. The economic nationalist theory explains e-waste import volume pre Basel shift in developing countries. However, post shift the new endogenous growth theory better explains waste import practices.

Table 6.2 outlines the hypotheses results for the pre Basel shift model.[2] Hypotheses 1a-c is that the economic factor has a medium positive impact on electronic waste import volume. This hypothesis is accepted in the combined model and partially accepted in the developed and developing models. The economic factor has a medium but negative positive effect on volume in developed countries. It has a large positive effect in developing countries.

Hypotheses 2a-c states the political factor has a small positive effect in the combined model, a small negative effect in developed countries and a medium positive effect in developing countries. The hypothesis is accepted when country types are combined and in the

[2] Refer to Chapter 5.

developing model. The hypothesis is partially accepted in developed countries. The political factor has a small effect on electronic waste import volume but volume increases rather than decreases.

Hypotheses 3a-c posit that the environmental factor has a small negative effect on electronic waste import volume. The hypothesis is accepted in developing countries and partially accepted in the combined and developed models. In the latter models, volume decreases but the effect size is larger than what is expected.

Hypotheses 4a-c consider the economic factor's effect size on electronic waste import volume when the political factor intervenes on the relationship. It is hypothesized that that when the political factor intervenes, the relationship between the economic factor and volume is stronger when the political factor is lower. Additionally, it is expected that the effect will increase volume. The hypothesis is partially accepted in the combined and developing models. In the combined model, the political factor does not impact the relationship between the economic factor and import volume. However, volume increases as suspected. Alternatively, in developing countries, the economic factor does not have a stronger effect when the value of the political factor is low but waste volume increases.

Hypotheses 5a-c evaluates the environmental factor's influence on electronic waste import volume when the political factor moderates on the relationship between the environment and e-waste. The hypotheses conjectures that this influence causes the environmental factor to have a negative effect on volume. It also expects the environmental factor to have a larger effect on volume when the political factor is larger. The hypotheses are accepted in all models.

Table 6.2 Hypotheses Results - Pre Basel Shift

	Expected Effect Size Pre Basel Shift			Actual Effect Size Pre Basel Shift			Actual Effect Size Pre Basel Shift		
Hypothesis	Combined	Developed	Developing	Combined	Developed	Developing	Combined	Developed	Developing
H1: Economic factor impact on electronic waste import volume	medium/+	medium/+	medium/+	medium/+*	medium/-	large/+*	✓	~	~
H2: Political factor impact on electronic waste import volume	small/+	small/-	medium/+	small/+*	small/+	medium/+*	✓	~	✓
H3: Environmental factor impact on electronic waste import volume	small/-	small/-	small/-	medium/-*	medium/-	small/-*	~	~	✓
H4: The effect of the economic factor volume depends on the political factor	+	+	+	-	-	+*	~	✗	~
H5: The effect of the environmental factor depends on the political factor	-	-	-	-	-	-	✓	✓	✓

small ≤ .10, medium ≈ .30, large ≥ .50 positive = (+) negative = (-) ✓ accept ~ partial acceptance ✗ reject

* Significant: p-value < .05

Table 6.3 shows the hypotheses results for the post Basel shift model.[3] Hypotheses 1a-c is that the economic factor has a medium positive impact on electronic waste import volume. The hypothesis is accepted in the combined model and partially accepted in developing models. In developing nations, volume increases but the effect size is smaller than what is hypothesized. The hypothesis is rejected in developed countries; the effect size is small and the directional flow of waste is opposite to what is hypothesized.

Hypotheses 2a-c states the political factor has a small positive effect in all models. The hypothesis is accepted when country types are combined. The hypothesis is accepted in the combined model. The hypotheses are partially accepted when country types are model independently. The political factor has a medium sized effect on electronic waste import volume and increases volume in both developed and developing countries.

Hypotheses 3a-c posit that the environmental factor has a small negative effect on electronic waste import volume. The hypothesis is accepted in the combined and developing models. It is partially accepted in the developed model. The environmental factor has a larger effect than what is expected.

Hypotheses 4a-c assume the political factor impacts the effect size of the economic factor's influence on electronic waste import volume. It is expected that the economic factor will have a stronger effect on volume when the political value is low. It also posits that the influence yields a positive effect on volume. The hypothesis is partially accepted in the combined model. Volume increases but the relationship is stronger when the value of the political factor is higher. The hypothesis is rejected in the developed and developing models. In the developed model, the political factor does not influence the relationship between the economic factor and volume. Additionally, volume remains relatively flat. In developing countries, the relationship between the economic factor and e-waste import volume is equally strong at all political levels. Furthermore, volume decreases when the political value is low.

[3] Refer to Chapter 5.

Hypotheses 5a-c expect the environmental factor's impact on electronic waste import volume is stronger when the political factor is larger. It is also expected that the effect will decrease electronic waste import volume. The hypotheses are accepted in all the models.

Table 6.3 Hypotheses Results - Post Basel Shift

	Expected Effect Size Post Basel Shift			Actual Effect Size Post Basel Shift			Actual Effect Size Post Basel Shift		
Hypothesis	Combined	Developed	Developing	Combined	Developed	Developing	Combined	Developed	Developing
H1: Economic factor impact on electronic waste import volume	medium/+	medium/+	medium/+	medium/+*	small/-	small/+	✓	✗	~
H2: Political factor impact on electronic waste import volume	small/+	small/+	small/+	small/+*	medium/+	medium/+	✓	~	~
H3: Environmental factor impact on electronic waste import volume	small/-	small/-	small/-	small/-*	medium/-	small/-	✓	~	✓
H4: The effect of the economic factor volume depends on the political factor	+	+	+	+	-	+	~	✗	✗
H5: The effect of the environmental factor depends on the political factor	-	-	-	-	-	-	✓	✓	✓

small ≤ .10, medium ≈ .30, large ≥ .50 positive = (+) negative = (-) ✓ accept ~ partial acceptance ✗ reject

* Significant: p-value < .05

FUTURE RESEARCH

This study finds that developed and developing countries electronic waste import volume are driven by different factors. Therefore, future studies should assess country types when attempting to understand waste trade practices. While this project focused on factors that influence electronic waste importation. An equally interesting project is to test relationship of the factors between trading partners.

Furthermore, a large scale quantitative study such as this is useful for testing hypotheses about what factors have the most effect on electronic waste import volume, hypotheses which would be difficult or impossible to test using case study analysis. However, future research should apply the Waste Trade Framework at the national level (individual country case study) to explore how the factors influence a single country's decision to import electronic waste. For example, a qualitative project can assess the economic and environmental policies that drive states to import waste. This type of analysis provides a more granular view to the political economy of electronic waste importation.

Moreover, the results of this project reveal that innovation and the amount of goods and services exported are more critical to the political and economic factors than what current literature suggests. Future studies should not overlook these variables. Also, in alignment with other studies on hazardous waste, the effect of capital abundance (GDP/capita) yields mixed results. Although it would be difficult to obtain, capital/worker, specifically capital/worker in the waste recycling industry, is a better measure to assess the effect of capital abundance in electronic waste importation practices.

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APPENDIX

Table 1A Top Electronic Waste Importers (in tons)

Country	1996	1998	2000	2006	2010	2015
Mexico	31,265	47,684	38,512	115,353	199,580	173,459
Rep. of Korea	3,244	11,695	15,154	54,552	197,739	426,733
Belgium	30,015	28,370	46,909	34,841	76,385	56,233
Indonesia	387,544	372	67,901	3,993	312	502
Sweden		36,114	33,813	37,796	31,668	30,220
Canada			39		106,875	68,177
France	68,705	29,100	24,776	10,264	37,185	19,907
Slovenia	20,653	14,006	24,199	26,937	37,878	34,742
USA*			14,190	30,326	37,420	40,384
Germany	5,698	4,889	8,350	17,918	24,076	64,952
Spain	7	3,184	21,731	3,745	33,964	49,224
Czech Rep.			1	6,865	39,334	42,304
United Kingdom	15,616	12,613	15,208	17,960	25,011	13,173
Poland				14,245	19,013	16,014
India				5,135	4,256	44,157
Netherlands	2,454		33	9,131	23,704	13,020
Philippines			5,347	27,119	4,028	5,035
Austria		18,890		14,910	13,373	8,019
Estonia	657		2,906	10,886	17,222	13,455
Bulgaria				2,574	5,638	22,796

Source: UNComtrade Database

Notes:
*Country is a top exporter and importer of electronic waste.
Highest importers were chosen based on the highest average of the six- year period.
Belgium and Luxembourg reported imported volume jointly in 1996 and 1998. For this analysis, the volume was relocated to Belgium for these time periods because it traded substantially more waste in subsequent years.

Table 2A Export Volume of Highest Exporters (in tons)

Country	1996	1998	2000	2006	2010	2015
USA*		17,779	14,300	1,206,124	307,863	516,856
France	1,899	33,030	40,197	96,493	113,029	104,440
United Arab Emirates						32,806
Netherlands	10,542	29,935	751	27,915	50,861	72,387
Canada*						27,860
Belgium*	42,638	22,629	21,543		30,154	21,855
Japan	3	104	55	9,124	47,747	84,015
Singapore						22,546
Hungary	115	19,615	18,954	22,568	31,995	23,166
Germany*	14,360	25,921	19,856	23,254	13,515	16,189
Denmark	228	21,501	27,196	19,635	24,661	19,541
Switzerland	4,291	7,624	8,272	11,478	25,759	27,420
Dominican Rep.				867	27,726	12,063
Norway	4,989	3,827		18,423	18,509	21,452
Romania		10,681	22,585	7,210	4,818	15,119
South Africa			131	1	1,171	43,801
Kuwait					17,165	2,271
Finland		12,133	447	11,592	16,509	16,463
Chile		420		4,526	20,933	
Lithuania		4,035	5,937	1,733	16,395	12,247

Source: UNComtrade Database

Notes:
*Country is a top exporter and importer of electronic waste.
Highest importers were chosen based on the highest average of the six- year period.
Belgium and Luxembourg reported imported volume jointly in 1996 and 1998. For this analysis, the volume was relocated to Belgium for these time periods because it traded substantially more waste in subsequent years.

Basel Convention Timeline[1]

1989 Basel Convention opts to control the transboundary movement and disposal of toxic waste.

1994 **Technical guidelines** published for environmentally sound waste management practices.

1995 **Ban Amendment (Annex VII)** adopted. Prohibits OECD countries from sending recyclable and non-recyclable waste from OECD countries to non-OECD countries.*

1998 **Annex VIII and IX** enacted. Add more types of waste that is regulated by the convention.

1999 **Basel Protocol on Liability and Compensation for Damage** formed to regulate civil liability due to damage that occurs during transboundary movement of hazardous waste, including illegal movement.*

2002 **Promoting Implementation and Compliance Committee** established to assist nations to comply with the parameters and obligations set forth in the convention.

Strategic Plan for Implementation of Basel Convention established to assist less developed nations with implementing the Basel Convention through 2010.

2003 **Public-Private Partnership** founded to create technical guidelines to manage end-of-life electronic devices and electronic waste. Mobile Phone Partnership Initiative developed guidelines for end of life mobile phones through 2008.[2]

2008 Basel Convention shifts view of waste from a costly by product to one of a valuable resource.[3]

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[1] Basel Convention, "Milestones".

[2] "E-Waste Overview," Accessed June 2016, http://www.basel.int/Implementation/TechnicalAssistance/Partnerships/PACE/Overview/tabid/3243/Default.aspx.

2011 **Partnership for Action on Computing Equipment (PACE)** provides guidance document on the end of life management of computing equipment.[4]

2015 **Technical guidelines** established for transboundary movement of electronic and electrical waste.[5]

*Not entered into force as of January 1, 2011.

Table 3A Waste Trade Framework: dimensionality and association between factors and indicators

Num.	Indicators	Relevant Literature
1	GDP	Antweiler et. al (2001), Clapp (2001), Bhagwati (2004), Baggs (2009), Lepawsky (2009), Higashida and Managi (2014)
2	GDP /capita (US $)	Montgomery (1992, 1995), Baggs (2009), **Lepawsky and McNabb (2010)**, Kellenberg (2012), **Estrada-Ayub & Kahhat (2014)**, Higashida and Managi (2014), Lucier and Gareau (2015)
3	Export of Goods and Services	Krasner (1976), Clapp (2001)
4	Tax Rate	Levinson (1999a), Levinson (1999b), Cassing and Kuhn (2003), Kellenberg (2010)
5	Polity	Sigman (1996), Levinson (1999), O'Neill (2000), Drury 2006, Li and Reuvenuy (2006), Fiorino (2011)
6	Corruption	Graeff (2003), G. Fredriksson (2003), Nwabuzor (2005), Wilson and Damania (2005), Drury (2006), Billger and Goel (2009), Pieroni and d'Agostino (2013)
7	Innovation	Jaffe and Palmer (1997), Hemmelskamp et. al (2000), Gilpin (2001), **United Nations Environment Programme (2011)**, Ambec et.al (2013), USTIC (2013), Global Index Report (2015)
8	Freedom to Trade	Graeff (2003), Nwabuzor (2005), Baggs (2009), Billger and Goel (2009), Pieroni and d'Agostino (2013)

[3] Basel Convention, "Our Sustainable Future: The Role of the Basel Convention," 3.

[4] Basel Convention, "E-Waste Overview".

[5] Secretariat of the Basel Convention, "Technical Guidelines on Transboundary Movements of Electrical and Electronic Waste," (Geneva, Switzerland: UNEP, Basel Convention, 2015).

9	Environmental Protection Index	Fiorino (2011), Kellenberg (2012), Brunel and Levinson (2016), Green Growth (2015)
10	Environmental Treaties	Mitchell (2003), Diamantoudi & Sartzetakis (2002), Barrett (2005), Bernhagen (2008), Kellenberg and Levinson (2014)
11	Basel Convention	Wirth (2007), Andrews (2009), Baggs (2009), Kellenberg (2012, 2014, 2015), **Jing (2014),** Lucier and Gareau (2015), **Khan (2016)**
12	Basel Ban Amendment	Andrews (2009), Baggs (2009), Kellenberg (2012, 2015), **Jing (2014),** Lucier and Gareau (2015)

Note: Bolded literature focuses on electronic waste.

Table 4A Overview of waste trade studies and methodologies

Num.	Author	Title	Methodology
1	O'Neill (2000)	Waste trading among rich nations: building a new theory of environmental regulation	Case Studies
2	Clapp (2001)	Toxic exports: the transfer of hazardous wastes from rich to poor countries	Case Studies
3	Cassing and Kuhn (2003)	Strategic Environmental Policies When Waste Products Are Tradable	Mathematical Proofs Game Theory
4	van Beukering et. al (2006)	Modelling and analysis of international recycling between developed and developing countries	Mathematical proofs
5	Baggs (2009)	International Trade in Hazardous Waste	Ordinary least squares gravity model 1st Stage: Probit 2nd Stage: Maximum likelihood
6	**Lepawsky (2009)**	Tracking e-scrap on the grey market	Network Analysis Model Ordinary Least Squares
7	**Lepawsky and McNabb (2010)**	Mapping international flows of electronic waste	Network Analysis Model
8	Kellenberg (2010)	Consumer Waste, Backhauling and Pollution Havens	Mathematical proofs Econometric model
9	Kellenberg (2012)	Trading Waste	Gravity model Poisson pseudo maximum likelihood
10	**Kaushal and Nema (2013)**	Strategic Analysis of Computer Waste Management Options: Game-Theoretic Approach	Game Theory

11	Higashida and Managi (2014)	Determinants of trade in recyclable wastes: evidence from commodity-based trade of waste and scrap	Gravity model Poisson pseudo maximum likelihood
12	**Lepawsky (2014)**	The changing geography of global trade in electronic discards: time to rethink the e-waste problem	Network Analysis Model
13	**Wakolbinger et. al (2014)**	When and for whom would e-waste be a treasure trove?	Mathematical proofs

Table 5A Waste Trade Framework

Factor	Indicator (Variable)	Source	Definition
ECONOMIC	GDP	World Bank	The sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.
	GDP /capita (US $)	World Bank	The sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. GDP per capita is gross domestic product divided by midyear population.
	Export of Goods and Services (% of GDP)	World Bank	Exports of goods and services represent the value of all goods and other market services provided to the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services.
	Total Tax Rate	Global Competitiveness Index	Measures the amount of taxes and mandatory contributions payable by a business in the second year of operation, expressed as a share of commercial profit.
POLITICAL	Polity	Polity IV Project Index	Measures government type. Scale ranges from -10 (completely authoritarian) to +10 (completely democratic).
	Corruption	Corruption Perceptions Index	Measures the level of perceived governmental corruption. Scale ranges from 0–100 in which a score of 100 indicates very little perceived corruption.
	Innovation	Global Competitiveness Index	Ranking of countries' innovation measures that promote research and development.
	Freedom to Trade	Index of Economic Freedom	The extent of tariff and non-tariff barriers that affect imports and exports of goods and services. The scale ranges from 0 -100 in which a score of 100 is closest to the target and represents the most freedom to trade.

Table 5A Continued

ENVIRONMENTAL	EPI	Environmental Protection Index	Proxy for regulatory stringency. Measures the protection of human health from environmental harm. The scale ranges from 0 -100 in which a score of 100 is closest to the target and represents excellent environmental performance.
	Environmental Treaties	Socioeconomic Data and Applications Center	Absolute number of environmental agreements a country has ratified.
	Basel Convention	Basel Convention	Dichotomous indicator of whether the Basel Convention has been ratified and/or entered into force.
	Basel Ban Amendment	Basel Convention	Dichotomous indicator of whether the Ban Amendment of the Basel Convention has been ratified and/or entered into force.

Table 6A Countries in Study

	Country	Developed		Country	Developed
1	Albania	0	35	Estonia	1
2	Algeria	0	36	Ethiopia	0
3	Argentina	0	37	Fiji	0
4	Australia	1	38	Finland	1
5	Austria	1	39	France	1
6	Azerbaijan	0	40	Georgia	0
7	Bahrain	0	41	Germany	1
8	Bangladesh	0	42	Ghana	0
9	Belarus	0	43	Greece	1
10	Belgium	1	44	Guatemala	0
11	Benin	0	45	Guinea	0
12	Bhutan	0	46	Guyana	0
13	Bolivia	0	47	Honduras	0
14	Bosnia and Herzegovina	0	48	Hong Kong SAR, China	1
15	Botswana	0	49	Hungary	0
16	Brazil	0	50	Iceland	1
17	Bulgaria	0	51	India	0
18	Burundi	0	52	Indonesia	0
19	Cambodia	0	53	Iran	0
20	Cameroon	0	54	Ireland	1
21	Canada	1	55	Israel	1
22	Chile	0	56	Italy	1
23	China	0	57	Jamaica	0
24	Colombia	0	58	Japan	1
25	Costa Rica	0	59	Jordan	0
26	Croatia	0	60	Kazakhstan	0
27	Cuba	0	61	Kenya	0
28	Cyprus	1	62	Kuwait	0
29	Czech Republic	1	63	Kyrgyzstan	0
30	Denmark	1	64	Latvia	1
31	Dominican Republic	0	65	Lesotho	0
32	Ecuador	0	66	Lithuania	1
33	Egypt	0	67	Luxembourg	1
34	El Salvador	0	68	Macao SAR, China	1

Note: 1 is developed country. 0 is not developed country.

Table 6A Continued

	Country	Developed		Country	Developed
69	Macedonia	0	103	Singapore	1
70	Madagascar	0	104	Slovakia	1
71	Malawi	0	105	Slovenia	1
72	Malaysia	0	106	South Africa	0
73	Mali	0	107	South Korea	1
74	Malta	1	108	Spain	1
75	Mauritania	0	109	Sri Lanka	0
76	Mauritius	0	110	Swaziland	0
77	Mexico	0	111	Sweden	1
78	Mongolia	0	112	Switzerland	1
79	Morocco	0	113	Tanzania	0
80	Mozambique	0	114	Thailand	0
81	Namibia	0	115	Togo	0
82	Nepal	0	116	Tonga	0
83	Netherlands	1	117	Trinidad and Tobago	0
84	New Zealand	1	118	Tunisia	0
85	Nicaragua	0	119	Turkey	0
86	Niger	0	120	Uganda	0
87	Nigeria	0	121	Ukraine	0
88	Norway	1	122	United Arab Emirates	0
89	Oman	0	123	United Kingdom	1
90	Pakistan	0	124	United States	1
91	Panama	0	125	Uruguay	0
92	Paraguay	0	126	Venezuela	0
93	Peru	0	127	Vietnam	0
94	Philippines	0	128	Yemen	0
95	Poland	0	129	Zambia	0
96	Portugal	1	130	Zimbabwe	0
97	Qatar	0			
98	Romania	0			
99	Rwanda	0			
100	Saudi Arabia	0			
101	Senegal	0			
102	Seychelles	0			

Table 7A Sample Size

Year	n	Developed	Developing
1998	54	25	29
2000	70	31	39
2002	75	30	45
2004	83	35	48
2006	90	31	59
2008	102	35	67
2010	104	35	69
2012	95	33	62
2014	84	31	53
Total	757	286	471

Table 8A Weight Conversion

	Std Dev of Import Volume (Tons)		
	Overall	Pre Basel	Post Basel
Combined	35,831	12,711	48,447
Developed	35,150	12,070	48,853
Developing	35,840	12,773	47,547

	Overall Weight Change (Tons)		
	Combined	Developed	Developing
Economic --> Import Volume	13,795	-5,624	5,914
Political Economy --> Import Volume	1,935	-9,069	32,113
Political --> Import Volume	2,293	-2,214	7,562
Political Environment --> Import Volume	-430	-2,004	-1,004
Environment --> Import Volume	-2,616	-1,336	-3,297

	Pre Basel Weight Change (Tons)		
	Combined	Developed	Developing
Economic --> Import Volume	2,186	-2,088	7,140
Political Economy --> Import Volume	-242	-1,183	6,029
Political --> Import Volume	1,462	1,062	2,363
Political Environment --> Import Volume	-229	-350	-715
Environment --> Import Volume	-1,551	-2,583	-1,277

	Post Basel Weight Change (Tons)		
	Combined	Developed	Developing
Economic --> Import Volume	17,974	-830	4,992
Political Economy --> Import Volume	6,153	-1,368	63,856
Political --> Import Volume	4,554	12,457	17,688
Political Environment --> Import Volume	-2,180	-11,334	-3,328
Environment --> Import Volume	-5,232	-14,070	-4,517

VITA

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CONFERENCES AND PRESENTATIONS

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Midwest Political Science Association, April 2016, "An Integrated Approach Evaluating Influencers on the Political Economy of E-Waste Trade."

Old Dominion University, Graduate Research Conference, April 2015, Paper: "Does Globalization Increase E-Waste Importation?"

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