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Ambiguous Protection

Abstract

Import regulations are globally the most prevalent form of intervention in international trade. The regulations should, under rules of the WTO, protect consumers and the environment but can be used to protect producers. We investigate the ambiguity of intent. We set out a model that when applied empirically suggests, as a benchmark estimate, equal divide between social benefit and producer protection. Inefficiency and distributional effects are consistent with producer-protecting trade policy. Country diversity in use of regulations supplements our estimates in suggesting producer-protecting intent. We look at how WTO procedures have allowed producer protection in the guise of social benefit.

JEL Codes: F130, F140, L150, L510.

Keywords: protectionism, World Trade Organization, regulation, non-tariff barriers, public safety, environmental protection.

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1. Introduction

There are two categories of import regulations. Sanitary and phytosanitary standards (SPS) are intended to protect humans, animals, and plants from diseases, pests, and contaminants, and typically involve agricultural products and food. In the U.S., for example, consumers have been beneficially protected from imports of peanut butter containing aflatoxins, shrimp containing antibiotic residues, pistachios that fail to pass mycotoxins standards, and E-coli in processed seafood and fish products.[1] A second category of regulations, technical barriers to trade (TBT), principally affects manufactured goods through technical specifications, standards, and testing and certification procedures. Although intended under the rules of the World Trade Organization (WTO) for societal benefit, the two types of regulations can, by selective application to imports, protect producers.

The incentive for producer protection is recognized. A WTO statement about SPS regulations for example observes that:

> "All governments accept the fact that some trade restrictions may be necessary to ensure food safety and animal and plant health protection. However, governments are sometimes pressured to go beyond what is needed for health protection and to

[1] We thank John Beghin for these examples.

use sanitary and phytosanitary restrictions to shield domestic producers from economic competition."[2]

The same producer-protecting incentives apply to TBT regulations. There is therefore ambiguity in intent of the two types of import regulations.

The ambiguity is unique in policies affecting international trade. Tariffs, through political incentives, unambiguously protect producers (Hillman 1982; Cassing and Hillman 1986, Grossman and Helpman 1994).[3] Import quotas create quota rents (Krueger 1974) but also quotas are political alternatives to tariffs for producer protection (Cassing and Hillman 1985). Forms of non-tariff barriers unambiguously protect producers (Hoekman and Kostecki 2009).[4] Preferential trade agreements (Kemp and Wan 1976) benefit producers by providing foreign market access (Hillman et al. 1995; Grossman and Helpman 1995; Hillman and Moser 1996). Producers also benefit from exceptions within preferential trade

[2] https://www.wto.org/english/tratop_e/sps_e/spsund_e.htm. Although the reference is to 'producers', all imperfectly mobile factors of production in an industry benefit from industry protection (Grossman 1983).

[3] In the equilibrium portrayed in Grossman and Helpman (1994), all producer rents are extracted for political benefit through take-it-or-leave it offers of the protection-selling politician. In the portrayal, producers are left with no benefits. The model can be amended to show protection for producer benefit.

[4] Producer-protecting non-tariff barriers include anti-dumping and countervailing duties (see for example Ethier 1982 and Rosendorff 1996), local content requirements (Hufbauer et al. 2013), preferential government procurement (Evenett and Hoekman 2006 and Long and Stähler 2009), and state trading (McCorriston and MacLaren 2005a,b). State aid is a form of non-tariff barrier as also is bureaucratic arbitrariness in accepting certification of origin and shipping documents, and harassment for bribes (Kiriti-Ng'ang'a 2014).

agreements.[5] With *all other* means of trade intervention benefiting producers,[6] to what extent are import regulations likewise used for producer benefit, in particular if international trade agreements have curtailed use of traditional producer-protecting tariffs and quotas?

How widely are import regulations used compared to tariffs and quotas? Table 1 shows the scope of use of import regulations in 2018 for a sample of countries. Column (1) shows numbers of SPS measures and column (2) TBT measures. The two types of regulations are combined in column (3).[7] Tariff rates shown in column (7) are in general insignificant for high-income countries.[8] Quotas are shown used alone in column (5), and used together with quotas (tariff-rated quotas) in column (6), with the two quota categories combined in column (4).

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[5] Preferential trade agreements allow departure from the most-favored nation clause of multilateral trade agreements (on which see Ethier 2002). For explanations for preferential trade agreements indirectly related to trade, see Ethier (1998) on investment incentives (NAFTA) and Schiff and Winters (1998) on agreements as trust-building devices to avoid future conflict (the European Union).

[6] There is social benefit from a terms-of-trade-improving 'optimum tariff.' The social benefit is controversial (Ethier and Hillman 2019).

[7] Since November 2016, information on countries' regulatory trade measures has been available on-line (at http://www.epingalert.org/en).

[8] In low-income countries, tariffs are higher because of reliance on tariffs for budgetary revenue (Hillman 2019, chapter 2). The average tariff rates in the table are biased downward. With tariffs trade-weighted, higher tariffs reduce weights in the computation of country averages due to lower import demand at tariff-inclusive domestic prices.

Table 1: Means of trade intervention in a sample of countries, 2018

Country	*SPS (1)*	*TBT (2)*	*Total regulatory measures 3=(1)+(2)*	*Total quotas 4=(5)+(6)*	*Quotas (5)*	*Tariffs with quota (6)*	*Average percent tariff rate (7)*	Per capita GDP (8)
United States	3041	1631	4,672	111	59	52	1.66	62,795
EU	702	1248	1,950	105	18	87	<2	36,570
Canada	1231	702	1,933	61	40	21	1.52	46,233
Australia	465	209	674	180	178	2	1.18	57,373
Switzerland	73	303	376	67	39	28	1.31	82,797
China	1256	1230	2,486	53	43	10	3.83	9,771
South Korea	622	900	1,522	159	92	67	8.67	31,363
Japan	610	845	1,455	103	85	18	2.51	39,290
Thailand	259	636	895	135	112	23	3.52	7,274
Philippines	429	263	692	55	21	34	3.40	3,103
India	227	131	358	61	59	2	6.35	2,010
Indonesia	122	121	243	2	-	2	2.64	3,894
Malaysia	43	240	283	13	-	13	4.02	11,373
Singapore	61	64	125	143	143	-	0.07	64,582
Hong Kong	42	80	122	142	142	-	0	48,676
Ghana	5	9	14	-	-	-	10.79	2,202
Liberia	1	3	4	-	-	-	12.18	677
Congo (DR)	-	3	3	-	-	-	11.03	562

Source: (1) – (7) http://i-tip.wto.org/goods/Forms/ProductViewNew.aspx?mode=modify&action=search World Trade Organization, Geneva (WTO, 2019); The World Bank (8)

Table 2: Trade policy across regions, 2018

Region or country	*Sanitary and Phytosanitary (SPS) (1)*	*Technical barriers (TBT) (2)*	*Quantitative measures (3)*	*Tariffs with quota (4)*	*Regulatory measures (1)+(2) (5)*	*Quotas (3)+(4) (6)*	*(5)/(6)*
WORLD	18,048	25,742	1636	1274	43,790	2,910	0.066
REGIONS							
Middle East	1065	3700	-	12	4765	12	0.003
Least Developed	276	1803	50	-	2079	50	0.02
N. America	4633	2956	164	84	7589	248	0.04
Other America	4446	4367	141	228	8813	369	0.04
Africa	587	3068	50	82	3655	132	0.04
Asia	4358	5270	790	174	9628	964	0.10
Europe	1533	4437	88	681	5970	769	0.13
CIS	381	548	141	8	929	149	0.16

Source: World Trade Organization, Geneva (WTO, 2019).

Table 2 shows the global 43,790 regulatory measures in 2018 distributed across regions. The ratio between global use of the two categories of quotas and the two forms of import regulations is 0.066, suggesting insignificance of quotas that matches the insignificance of tariffs. Member countries' governments are obliged to report trade measures to the WTO. In 2017 import regulations accounted for 85 percent of countries' notifications of non-tariff measures and in 2019 for 92.2 percent of notifications.[9]

Import regulations are thus the primary means globally of intervention in international trade. Because of the wide scope of use, resolution of the ambiguity of intent of import regulations takes on importance. Resolution of ambiguity reveals whether regulation of imports should be added to the list of producer-protecting non-tariff barriers, and if so the weight that should be placed on import regulation in an index of producer-protecting non-tariff barriers such as is routinely used in empirical studies (for example Niu et al. 2018, Kinzius et al. 2019).

We are not the first to address the ambiguity of intent of import regulations. We relate to previous studies in section 2. Section 3 sets out the model that provides our predicative framework and estimation specification. Section 4 reports a baseline empirical estimate

[9] We thank Eytan Ronen for these computations, which use data from http://i-tip.wto.org/goods/Forms/GraphView.aspx?period=y&scale=lg.

using global industry-level data that suggests an equal divide in intent. An amendment to the model reinterprets the estimate as an upper bound to producer protection.

In section 5, we use country data that allow us to look further into the past than in our baseline estimates and to extend the time dimension to include the main period of WTO-sponsored trade liberalization. The estimates replicate the equal divide in the baseline results. We also find that use of import regulations increased as average tariff rates declined, which is consistent with substitution in producer protection from tariffs to non-tariff barriers that has been suggested in other studies.[10]

In section 6, we look for and find inefficiency and redistributional effects of import regulation such as are characteristic of producer-protecting policies in international trade. We do not estimate these effects directly, as would be required for a test of the Stolper-Samuelson theorem in the Heckscher-Ohlin model or for identifying income-distribution consequences in the specific-factors model of international trade (see Hillman 1989/2013, chapter 2, on the gainers and losers from protection in different models). Our aggregate data conceal heterogeneity in effects across individuals. We therefore link our primary dataset to data on financial wealth of more than 240,000 households in 96 countries.

[10] Feinberg and Reynolds (2007) found that administrative protection (anti-dumping and countervailing duties) substituted for tariffs. Niu et al. (2019) found tariff/non-tariff substitution except for OECD agriculture. Yu (2000) proposed a model of substitution of tariffs by voluntary export restraints. Hillman and Ursprung (1988) had demonstrated the political incentives for the latter substitution.

Inefficiency is indicated by a negative relation between import regulation and household wealth. Distributional effects are present, with high-wealth households having gained from regulation of imports and low-wealth households having lost, which we interpret as indicating that high-income households benefited differentially from the rents that producer protection created.

In section 7, we look at country diversity in use of import regulations. Consumers in countries with larger populations may consume greater varieties of goods but they should more or less equally, for reasons of personal and public safety, *not* consume the *same* goods. If regulations are intended to restrict imports for social benefit, the number of regulations should then not diverge much among countries with similar per capita incomes and development levels. There is considerable country divergence, which we interpret as suggesting presence of producer protection.

If there has been socially costly opportunism in use of import regulations, we should consider how the opportunism (actually deception) has come to occur. In section 8 we look at WTO procedures. The final section summarizes our study and also considers whether means might exist of preventing opportunistic use of import regulations.

2. Previous studies

Use of import regulations for producer protection has been proposed in previous studies.[11] A common empirical procedure has been to estimate how regulation has affected categories of imports. Ghodsi et al. (2018), for example, using data for 1995-2014, for 5100 product categories and 167 countries (including non-WTO members), found that non-tariff measures including import regulations decreased imports in 60 percent of cases.

Rather than *decreasing* imports, regulation can *increase* imports. Regulation increases imports if foreign producers have a comparative advantage in satisfying a country's regulatory requirements or if consumers use the higher standards of allowable imports as indicators of superior quality of imports. Beghin et al. (2015b), using data for 2001-2003 for 93 countries, concluded that import regulation was associated with increased imports in 39 percent of cases. Bao and Chen (2013) found for 103 countries over the period 1995–2008

[11] Grundke and Moser (2019) for example inferred protectionist intent for producers in the U.S. from discretionary stringency in application of regulatory import measures. Beverelli et al. (2019) concluded from WTO procedures that regulation of imports had substituted for prior producer protection through tariffs. Case studies have reported producer protection (for example Diaz Ross and Jaffee 2008 and Beestermöller et al. 2018). Begin et al. (2015a) and Ronen (2017a) have provided overviews of the literature. For a meta-analysis, see Li and Beghin (2012).

that TBT requirements increased imports into low-income countries and reduced imports into high-income countries.[12]

Regulation that increases imports is socially beneficial. For regulation that decreases imports, as Ghodsi (2015) noted, a finding that import regulation reduces imports is consistent with imports declining either because of socially beneficial regulation or because of producer protection. The ambiguity of intent of regulations is not addressed. We are not told *why* imports decreased.

To address the ambiguity of intent, an empirically estimable model is required that encompasses regulation increasing imports and in which imports can evoke regulations that can either be socially beneficial or producer-protecting. The focus is then not on how regulation affects imports as in previous studies, but on the converse relation of how imports affect regulation. We set out such a model in the following section.

[12] Cadot et al. (2018) using evidence from 500 product categories for 80 countries proposed association of SPS regulations with increased imports. In a case study, Ronen (2017b) found that import regulations, by setting quality standards, increased imports of virgin olive oil.

3. Model and estimation specification

3.1 A model of dual regulation

Our model divides imports into goods that have previously been imported and other 'new' imports. Imports of the goods previously imported increase in line with the marginal propensity to import as a country's income increases. The new goods arrive in consequence of liberalized trade but can also include new imports that have arisen because of socially beneficial regulation. We use this dichotomy empirically.

We assume two regulators in a country.[13] Regulator 1 sets societal standards that apply non-discriminately to domestic production and imports. We place regulator 1 within the Linder model of international trade, which bases trade on domestic-demand compatibility among countries with similar per capita-incomes (Linder 1961; Bergstrand 1990).[14] The model implies that when a country's income increases, quality and technical standards for domestic consumption and imports increase. Environmental standards also increase with income.[15] As income increases, regulator 1 beneficially determines that some

[13] Nadvi and Wältring (2004) have described the different initiating sources of import regulations in practice.

[14] See Choi (2002) and Hallak (2010) for empirical tests of the model.

[15] For evidence that environmental standards increase with income, see Grossman and Krueger (1995). Links between the environment and trade policy were studied by Schultze and Ursprung (2001). Hillman and Ursprung (1992, 1994) studied environmentalists as an interest group joining producer or consumers seeking to influence politically determined trade policy. There are incentives to move adverse environmental impacts elsewhere. Cassing and Long (2020) describe export of waste. Aichele and Felbermayr (2015) showed that

goods previously imported do not satisfy new heightened required standards. Imports decline because of imports of goods that are disallowed. But also imports can increase because goods subject to the new increased standards are attractive to consumers.[16]

Regulator 2 looks at the imports of new products (see Grossman and Helpman 1989; Feenstra 2006) not associated with the positive marginal propensity to import as income increase. The imports 'arrive' exogenously in the model. We do not rule out that regulator 2 restricts imports that have 'arrived' because of socially beneficial regulation of regulator 1. Regulator 2 responds to political 'needs' of producer protection (Hillman 1982; Grossman and Helpman 1994; Ethier and Hillman 2019). The regulatory response of regulator 2 is consistent with rent seeking (Tullock 1989; Long 2013; Hillman and Long 2019) and with regulation as sought by producers rather than consumers (Shughart and Thomas 2015).

'carbon leakage' occurred through imports into countries that had made commitments under the Kyoto Protocol; the 'leakage' took place when changes in relative prices due to regulation in countries committed to emissions reductions resulted in imports from non-committed countries. Environmental regulation has then affected comparative advantage in trade. See also Babiker (2005).

[16] Regulator 1 acts in a socially beneficial way to protect consumers and the environment from unsatisfactory imports. Social benefit from import regulation has been portrayed in other ways. Marette and Beghin (2010) describe foreign firms as better able to beneficially correct an adverse externality (and hence imports increase because of regulation). Fisher and Serra (2000) assume a socially benevolent planner regulating imports. In a Luddite-type model of social benefit, Barrett and Yang (2001) described a government that protects consumers from technologically advanced imports that would make consumers' past purchases obsolete. A source of social benefit from import regulation is product standardization (see Jones and Hudson 1996).

To provide background for the politically motivated decisions of regulator 2,[17] we denote the publicly-financed cost of implementing a producer-protecting import regulation in country j for good i by G_{ij} and the private producer cost of documentation and possible lobbying by C_{ij} (we omit for now notation for time). A protectionist trade-restricting regulation imposed by regulator 2 increases producer rents by $\Delta\pi_{ij}$, a proportion of which λ_{ij} is transferred to political benefit. The social welfare loss from protection of good i is ΔW_{ij}. The probability that consumers perceive the welfare loss is ρ_{ij}. The political cost of imposing a regulatory restriction on imports of good i is $\rho_{ij}\Delta W_{ij} \geq 0$. A producer-protecting regulation is imposed if a private cost-benefit calculation satisfies

$$(1 - \lambda_{ij})\Delta\pi_{ij} > C_{ij} \tag{1}$$

and a political cost-benefit calculation satisfies

$$\lambda_{ij}\Delta\pi_{ij} > G_{ij} + \rho_{ij}\Delta W_{ij}. \tag{2}$$

Combining (1) and (2), a necessary (but not sufficient) condition for a regulatory restraint that protects producers is

$$\Delta\pi_{ij} > C_{ij} + G_{ij} + \rho_{ij}\Delta W_{ij}, \tag{3}$$

[17] See also on lobbying regarding standards for imports Swinnen and Vandemoortele (2011) and Swinnen (2016). Saha (2019) describes lobbying for tariffs, which in principle is the same as a quest for trade-policy created rents.

which states that producer rents, no matter how shared, need to cover the monetary and political costs of the regulatory restriction. In (3), regulator 2 is seen to confront the characteristic trade-off between $\Delta\pi_{ij}$ and ΔW_{ij} of politically determined trade policy (Hillman 1982). For a regulation imposed by regulator 2, (1), (2), and (3) will have been satisfied.

Regulator 2 creates rents by taking advantage of asymmetric information.[18] Informed consumers and voters would support the decisions of regulator 1 and would oppose the decisions of regulator 2 but do not observe which regulator makes regulatory decisions with regard to imports of which goods.[19] If because of asymmetric information $\rho_{ij} = 0$, the value of ΔW_{ij} has no role in (3). We infer ρ_{ij} to be zero or low, so facilitating producer protection by regulator 2.

The decisions of the two regulators are independent. The regulators neither communicate nor coordinate. Increased imports associated with the marginal propensity to import as income increases, to which regulator 1 responds, are subtracted from total imports

[18] Tullock (1989) and Hillman and Ursprung (2016) describe rent creation through asymmetric information.

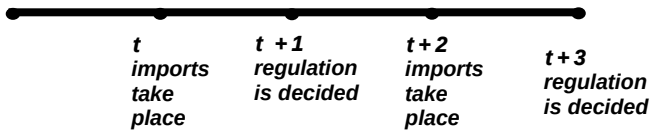
[19] If there is 'rational ignorance', consumers and voters recognizing their individual non-decisiveness in affecting regulatory decisions, would not bother to observe, if observation were possible.

to obtain what we call 'adjusted imports' that are in the domain of the politically motivated decisions of regulator 2.

3.2 Timing and exogeneity

We introduce time through the lag structure in figure 1. At time *t* imports take place and are observed and evaluated for regulation by the two regulators, who decide on new regulations that will be implemented at time *(t+1)* and apply to imports at time (*t+2)*. Imports at time *(t+2)* therefore depend on past regulations and are exogenous with respect to new regulations that will be introduced at time *(t+3)* and thereafter. Regulators can revise their past decisions. But imports always depend on past regulations. Future regulations depend on previous imports. The sources of change in imports, for regulator 1 through incomes, and for regulator 2 through arrival of new products, are exogenous to the regulators. Subject to the timing in figure 1, the question that the model addresses is 'how do imports affect regulation?'

Figure 1: Timing of imports and regulation



3.3 Estimation specification

To simplify notation, we now relate only to countries (industries and time are implicit). We observe the total number of regulatory measures N_j of country j consisting of an unobserved number of socially beneficial measures A_j decided upon by regulator 1 and a further unobserved number of regulations B_j decided upon by regulator 2. For country j, we have

$$N_j = A_j + B_j \ . \tag{4}$$

The prediction is that A_j increases with country j's income Y_j:

$$A_j = A_j(Y_j), \ \frac{dA_j(Y_j)}{dY_j} > 0. \tag{5}$$

B_j increases with the value of country j's 'adjusted' imports V_j net of imports predicted by the positive marginal propensity to import when country income increases:

$$B_j = B_j(V_j), \ \frac{dB_j(V_j)}{dV_j} > 0. \tag{6}$$

We assume linearity in (5) and (6). The total number of regulatory measures of country j is

$$N_j(Y_j, V_j) = A_j(Y_j) + B_j(V_j) = a_j Y_j + b_j V_j. \tag{7}$$

We estimate a_j and b_j.

3.4 Regulatory overlap

We use the assumption associating regulators with imports for the baseline model and estimates. As an amendment to the model, we allow for regulatory overlap. Define P_J^1 as the proportion of B_j due to decisions of regulator 1 and P_J^2 as the proportion of A_j due to decisions of regulator 2. We have no means of obtaining the values of P_J^1 and P_J^2. Our working assumption for regulatory overlap is $P_J^1 > P_J^2 = 0$. We assume that import surges that take place are in the goods previously imported in the domain of regulator 1 (otherwise how would it be known to be a surge). We appeal to the evidence that the producer-protecting trade measure used when an import surge takes place is administrative safeguard provisions (see for example Read 2005 and Sykes 2006), which can be applied more immediately than protective import regulations. The assumption that producer-protection-evoking import surges are addressed through safeguards measures implies $P_J^2 = 0$. Regulator 2 then does not make decisions in the domain of regulator 1. We do not rule out $P_J^1 > 0$ or regulator 1 making socially beneficial decisions about the 'new' products in the regulatory domain of regulator 2. Under these conditions of regulatory overlap, the estimates in (7) indicate an upper bound for producer protection.

3.5 Further assumptions

We assume that domestic markets for traded goods clear with excess demand satisfied through imports that the regulators have allowed. Domestic markets need not be competitive. We observe imports as excess demand but we do not observe domestic market structure. We do not attempt to estimate protective equivalents of import regulations.[20] Our estimates are derived from count-data empirical models.

4. Baseline empirical estimates

Our baseline estimates assume $P_J^1 = P_J^2 = 0$ (non-intersecting regulatory designation). We use data for 43 countries (28 EU countries and 15 other major countries) and 20 industries per country, giving 800 country-specific industries observed between 2000 and 2014. For income, we use gross-output by industry. The industry-level analysis eliminates time-invariant and time-varying unobservable variables at the country level that could confound the estimation results.[21]

[20] On measurement of levels of protection implied by regulatory trade measures, see Li and Beghin (2014), Beghin et al. (2015b), and Niu et al. (2018).

[21] The data are taken from the World Input-Output Tables (WIOT) compiled by Timmer et al. (2015). At the time of this study, the most recent release of this dataset is Release 2016. A previous release (Release 2013) reaches further back in time until the year 1995. The industry classifications are, however, not comparable with the classification of regulatory measures. Release 2013 only includes data until 2011. For our country-

4.1 The model for estimation

Using notation that includes countries, goods and time, we transform equation (7) into a panel data model of the form

$$N_{jit} = \alpha Y_{jit} + \beta V_{jit} + \varepsilon_{jit}, \tag{8}$$

where N_{jit} denotes the number of regulatory trade regulations in industry i of country j at time t. The parameters α and β are empirical estimates for a and b of equation (7). For identification, we augment the parsimonious model of equation (8) by two types of fixed effects that account for unobserved heterogeneity across countries and across country-years, and use lags of our key explanatory variables to (at least partly) address the concern of a reversed causation:

$$N_{jit} = \alpha Y_{jit-1} + \beta V_{jit-1} + \eta_i + \rho_j \times \zeta_t + \varepsilon_{jit}. \tag{9}$$

Time-invariant characteristics (such as political institutions, culture, and historical influences) can simultaneously influence GDP, trade, and the use of regulatory trade measures. Also, industries differ in the extent to which goods are tradable and in other industry-specific characteristics. Due to specialization and comparative advantage, countries have developed different industrial compositions over time, and because

level analysis, we employ data on real per capita GDP taken from the Penn World Tables, version 9.1 (on the Tables, see Feenstra et al. 2015). Data on imports are taken from World Bank (2019b).

industries vary in their extent to which the goods produced are tradeable, the national composition of industries can matter for the overall number of regulations in place. We account for these and any other sources of heterogeneity in time-invariant factors across industries in the countries included in our dataset by adding fixed effects η_i. Unobserved heterogeneity may also arise across time in the form of cross-country shocks and trends. In particular, we observe distinct time trends in the use of regulatory trade regulations (shown in figure 2). Most importantly, our industry-level analysis allows for the inclusion of country-year fixed effects, which absorb any observable or unobservable omitted variables that vary over time and over countries (such as national crises, a changing institutional framework at the national level, policy changes, and many more). The effects are included in equation (9) by the term $\rho_j \times \zeta_t$. Any time-varying shocks to the use of regulatory trade measures for specific industries in individual countries are absorbed by the idiosyncratic error ε_{jit}.

The key challenge for estimating equations (8) and (9) is finding proxies for V_{jit}, the elements of 'adjusted' import values that are net of the positive propensity to import when incomes increase. Accounting for the correlation between incomes and imports is important for both theoretical and statistical reasons. With respect to theory, an estimate $\beta > 0$ that is based on raw import series may point to protectionist motives or socially beneficial regulation when an increase in imports is driven by an increase in incomes. With respect to the statistical setting, using regressors that can be linearly predicted by other regressors

with substantial degree of accuracy ('multicollinearity') gives rise to imprecise parameter estimates for α and β. To expunge the components in the import time series that are due to changes in incomes, we use a simple regression-based technique. The observed total industry-level import values $\tilde{V}_{jit}$ are the sum of two components: (i) imports that are due to the income level V_{jit}^{Y}, and (ii) other imports V_{jit}:

$$\tilde{V}_{jit} = V_{jit}^{Y} + V_{jit}. \tag{10}$$

For our empirical technique, we are interested in the latter term of equation (10). The income-dependent term of equation (10) can be re-written as

$$V_{jit}^{Y} = \phi Y_{jit}, \tag{11}$$

with Y_{jit} denoting the income level of country j generated in i at time t, and with ϕ the country-industry-specific marginal propensity to import. Inserting (11) in (10) yields

$$\tilde{V}_{jit} = \phi Y_{jit} + V_{jti}, \tag{12}$$

which we estimate by OLS. The residuals of equation (12) given by V_{jti} are the non-income determined components of imports, which we have designated as 'adjusted' imports. Our approach results in an adjusted import series that is orthogonal to output by construction, reducing the correlation between contemporaneous industry-specific incomes and import values from almost 83% to zero.

4.2 Estimation technique

The number of regulatory measures is a discrete non-negative integer $N \in \mathbb{Z}$. Given that we have over-dispersed count data (the conditional variance greatly exceeds the conditional mean), we assume the stochastic model for N to be a Negative Binomial process. Our fixed-effects over-dispersion model assumes $N_{jit}|\gamma_{jit} \sim \text{Poisson}(\gamma_{jit})$ with $\gamma_{jit}|\eta_i \sim \text{Gamma}(\lambda_{jit}, 1/\eta_i)$ and dispersion parameter η_i. The parametrization follows from our benchmark model of equation (9) and is given by

$$\lambda_{jit} = \exp(\alpha Y_{jit-1} + \beta V_{jit-1} + \eta_i + \rho_j \times \zeta_t + \epsilon_{jit}), \tag{13}$$

where ϵ_{jit} denotes the offset. This results in the following specification

$$Pr\left[N_{jit} = n_{jit}|\eta_i\right] = \frac{\Gamma(\lambda_{jit}+n_{jit})}{\Gamma(\lambda_{jit})\Gamma(n_{jit}+1)}\left(\frac{1}{1+\eta_i}\right)^{\lambda_{jit}}\left(\frac{\eta_i}{1+\eta_i}\right)^{n_{jit}}, n = 0,1,2,\dots, \tag{14}$$

which yields a Negative Binomial model for industry i with constant within-group dispersion equal to $(1+\eta_i)$ (for a detailed description of the resulting log likelihood function, see Cameron and Trivedi 2013).

4.3 Baseline industry-level results

Our baseline results are reported in Table 3. Column (1) reports results from the most parsimonious model in which we regress the number of industry-specific restrictions per country on our key variables of interest, the industry-specific output level and industry-

specific adjusted imports. The model reveals a positive correlation between the number of regulatory measures and both incomes and adjusted imports. These relationships are statistically significant at the 1% level (in terms of output) and the 10% level (in terms of imports). In Columns (2)-(4), we gradually develop our preferred specification of equation (9), successively including industry-fixed effects (Column 2), country-year fixed effects (Column 3), as well as lags of the explanatory variables (Column 4).

The main result, reflected in all of the specifications reported in Table 3, is that both incomes and adjusted imports are positively related to the number of regulatory restrictions. The coefficients reported in Columns (2)-(4) are all statistically significant at the 1% level. In the full specification of Column (4), the estimated coefficient on industry-output is 0.062 ($z = 3.13$) and the parameter estimate for adjusted imports is 2.220 ($z = 6.69$). Taken together, the estimated parameters obtained in our industry-level analysis suggest that

> *Higher income levels and adjusted imports are both associated with a higher number of regulatory restrictions.*

The key question is whether one influence is dominant over the other. Computing conditional marginal effects relative to a one-standard deviation change, the estimates suggest that, on average, the effect of adjusted imports dominates the effect of income by a factor of 1.6. We cannot however statistically reject the null hypothesis that the 'true' relation between the marginal effects of imports of new goods and GDP equals unity. Hence, we conclude that:

The regulatory response to increases in adjusted imports of new goods is about the size of the regulatory response to increases in incomes – there is an approximate equal divide.

Regarding our model specification, the likelihood-ratio χ^2 test that examines whether the dispersion parameter is zero delivers large test statistics in all models ($3.0e + 04$ in our preferred specification in Column 4), with associated p-values < 0.0001. This result suggests that the response variable is over-dispersed and is not sufficiently described by the simpler Poisson distribution.

Table 3: Diversity of Use of Regulatory Trade Measures – Baseline Regression Results, Count Data Model, Industry-Level Results

Dependent variable: Number of regulatory restrictions in use, N_{ijt}

	Pooled Model (1)	Industry Fixed Effects (2)	Full Set of Fixed Effects (3)	Lags and Full Set of Fixed Effects (4)
GDP^{Ind}	1.250^{***}	0.351^{***}	0.071^{***}	
	(0.043)	(0.010)	(0.020)	
$\text{Imports}^{\text{Ind, adj}}$	4.270^{*}	4.890^{***}	2.310^{***}	
	(2.241)	(0.371)	(0.327)	
$\text{GDP}^{\text{Ind}}\,(t-1)$				0.062^{***}
				(0.019)
$\text{Imports}^{\text{Ind, adj}}\,(t-1)$				2.220^{***}
				(0.332)
Observations	12,000	12,000	11,200	11,200
Countries	40	40	40	40
Industries	800	800	800	800
LR / Wald χ^2	9.1e+07	1.4e+40	3.1e+04	3.0e+04
$\Pr[\text{LR/Wald} > \chi^2]$	0.000	0.000	0.000	0.000
Industry fixed effects	No	Yes	Yes	Yes
Country×Year fixed effects	No	No	Yes	Yes

Notes: The table reports regression results of our count data model on the influence of GDP and adjusted imports on the number of regulatory trade restrictions that are in place at the industry-level of countries. Data on GDP is taken from Penn World Tables 9.1, data on import values is taken from World Bank (2019b). Adjusted imports have been calculated as described in Section 4.1. Coefficients on GDP and adjusted imports are multiplied by 1,000,000 to facilitate readability.

*** Significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 1 percent level

4.4 Remarks

Our baseline estimates show that both income and adjusted imports are positive and statistically significant predictors of the number of regulatory trade restrictions. In line with the predictive framework of our model, we interpret this result as evidence that both societal and producer protection play a role in the introduction of import regulations. In all of our estimates, the marginal effects of a one-standard-deviation change suggested by the estimated coefficients on incomes and imports are not statistically distinguishable. We have interpreted this as evidence that producer and social protection are at par in regulatory responses, yielding an equal divide. These results do not account for regulatory overlap. If $P_J^1 > P_J^2 = 0$ (regulator 1 operates in the domain of regulator 2 but regulator 2 does not operate in the domain of regulator 1), the equal divide is, as we have indicated, an upper bound to producer protection.

It is important to note that fundamental macroeconomic variables such as GDP and imports are correlated with many other structural variables of an economy. To the extent that these factors vary between industries and countries (for example, because of different specializations that may react differently to global trends such as globalization and technological progress), we address them through our industry-level fixed effects. A key problem in country-level analyses is that period-specific factors may differ across countries. The main advantage of our industry-level specification is that we can eliminate such factors through our country-year fixed effects, which absorb any time-varying unobserved

heterogeneity on the country-level. These effects also eliminate more general cross-country trends (for example, when drastic events such as the Financial Crisis or the Covid-19 pandemic affect all countries similarly).

A remaining threat to the identification of a causal effect is that there may be time-varying factors at the industry-level that affect industries differently across countries. In our preferred specification, we use lagged levels of our key variables of interest to alleviate this concern, but we cannot rule out that time-varying unobservable variables on the industry-level exert influence on multiple periods, which would then influence our results. In order to bias our estimates, these factors need however to be independent of general time trends (such as decline of the industrial sector and increasing relevance of the service sector) and of country-year specific shocks.

Another important remark is that our results do not require that regulatory responses to income and adjusted imports completely and conclusively describe respective socially beneficial and producer-protecting intent. Rather, the underlying assumption is that increases in incomes are more reflective of a need for socially beneficial protection, while adjusted imports are more associated with producer protection. This allows us to compile an approximate estimate of the relative importance of the two intentions of protection that

is valid as long as there is no disproportionately strong asynchrony in the degree of violation of either the assumption for regulatory responses to GDP or adjusted imports.

A potential disadvantage of the industry-level perspective is that the proxy for income is industry-level income, which can reflect the dominance of particular domestic industries in a country's industry composition such as through specialization determined by comparative advantage in trade. In principle, if output is concentrated in a particular industry, a country can have high industry-level output for the one industry but overall have low per capita income. Fixed effects for country-years should however absorb cross-country differences in industry composition and hence mitigate this concern. In section 5, we address this concern more directly.

5. Extension to cover the period of trade liberalization

We now adopt a country-level perspective that allows reaching further back in time than 2000. We thereby forgo means to account for time-varying confounders through country-period fixed effects. The advantages are that we (i) cover the main era of trade liberalization, (ii) use data for a much larger set of countries (112 rather than 43), and (iii) proxy income by GDP per capita (rather than using industry-level values). We compiled a dataset with data over time mainly between 1994 and 2019 for cumulated regulatory measures, tariffs, and the timing of countries' trade liberalization. The data cover the world's main

liberalization episode between 1960 and 2000.[22] By the year 2000, some two thirds of all countries included in the dataset had liberalized trade, resulting in limited variation in the liberalization variable after that year.[23]

Figure 2 shows the development over time of global tariff rates, the number of countries that liberalized trade, and global regulatory measures on imports. Starting in the early 1990s, average tariffs declined as the number of countries that liberalized trade increased. While this points to freer trade, we observe a steep increase in regulations since the mid-1990s. Figure 2 suggests a positive correlation between the number of countries that liberalized trade and regulations on imports, but intent of the regulations is not indicated.

Figure 3 shows unconditional correlations between the number of regulations (again, without intent indicated) and (i) the level of GDP per capita, (ii) non-adjusted (total) trade volumes, and (iii) trade liberalization. The correlations in figure 3 are consistent with the predictions of our Linder-based model, in that countries with GDP per capita greater than the mean have a significantly larger number of regulatory measures than countries with lower income levels (left panel). Countries with above-average non-adjusted imports have more restrictions in place than countries that import less (middle panel). Also, the number

[22] The data were collected by Sachs and Werner (1995) with updates by Wacziarg and Welch (2003, 2008).

[23] Because of the limited variation after 2000, empirical studies involving trade liberalization have focused on the period between 1960 and 2000 (see for example Billmeier and Nannicini 2013).

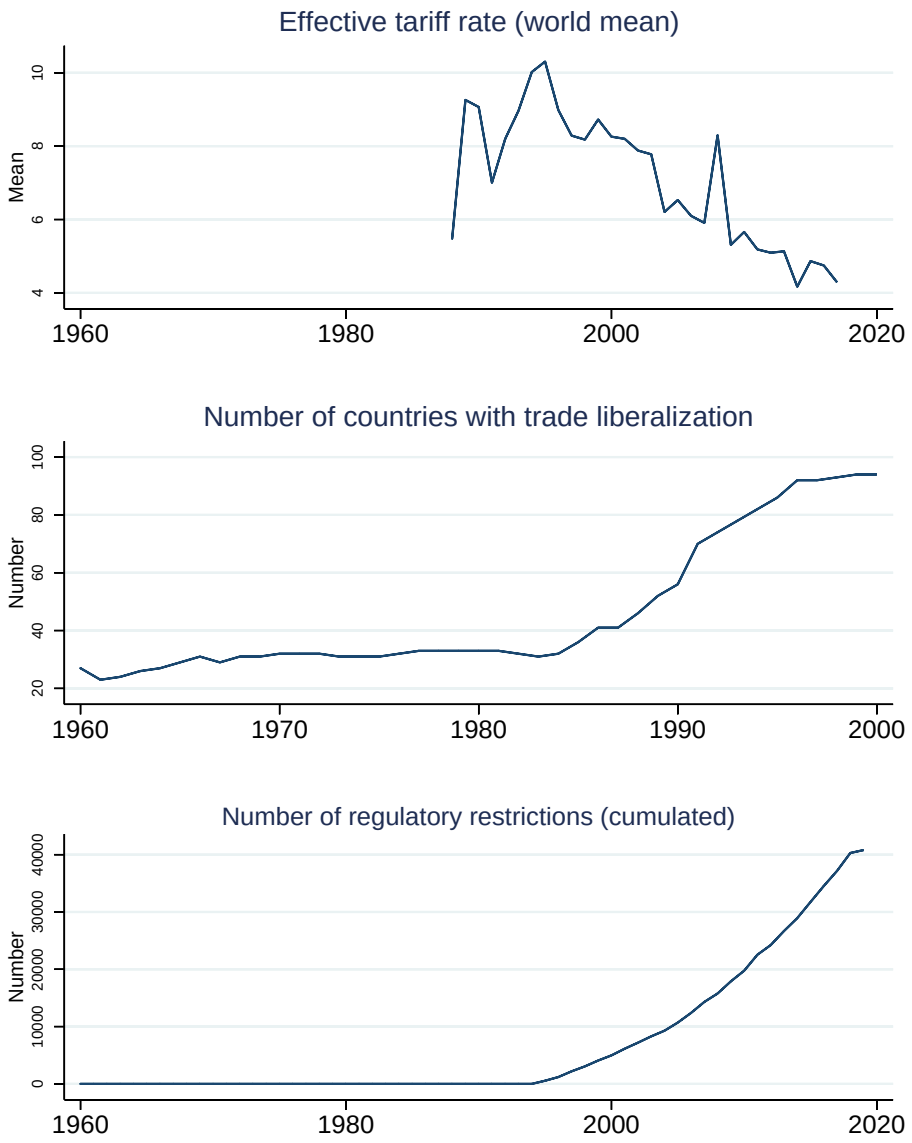
of regulatory restrictions is significantly higher in countries that had liberalized trade (right panel).

To proceed, we change the industry-level model to a country perspective, replicating the estimation technique described in section 4.2. On the country level, the parametrization of the Negative Binomial model simplifies to

$$\lambda_{jt} = \exp(\alpha Y_{jt-1} + \beta V_{jt-1} + \eta_j + \zeta_t + \psi_c \times \zeta_t + \epsilon_{jt}), \tag{15}$$

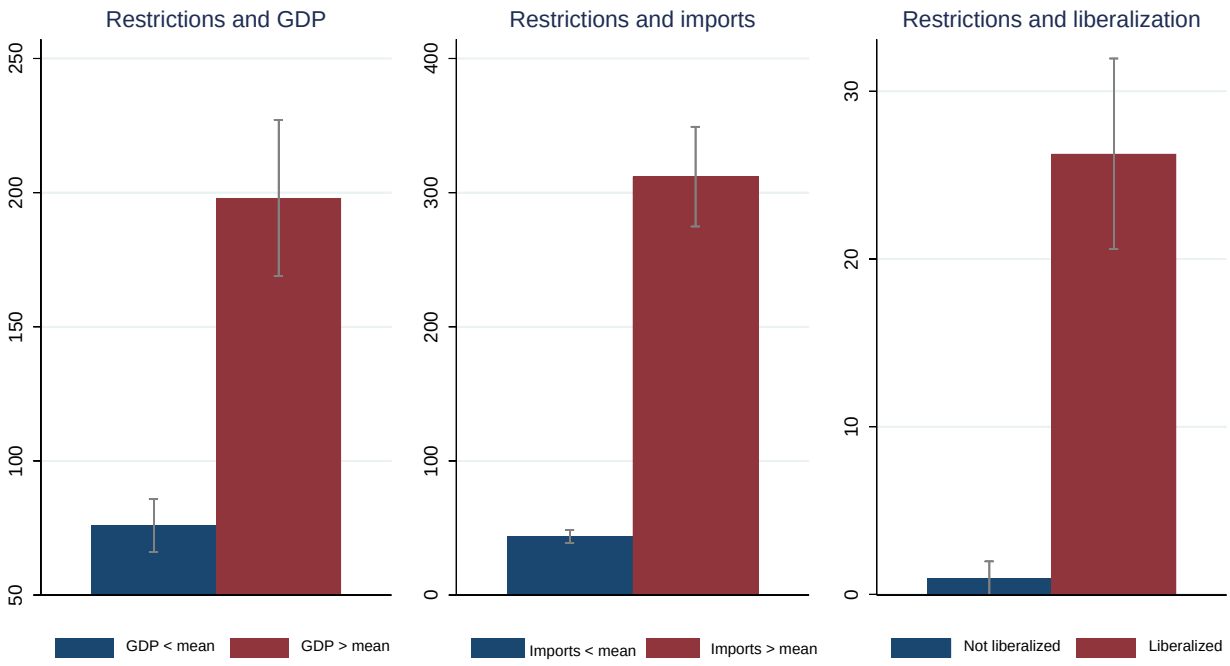
where η_j denotes fixed effects for countries, ζ_t again denotes fixed effects for years, and $\psi_c \times \zeta_t$ are continent-year fixed effects that account for time-varying unobservable variables on the continent level. Table 4 reports the results.

Figure 2: Effective tariff rates, number of countries that had liberalized trade, global regulatory measures on imports



Notes: Tariff rates are estimated by the World Bank (2019a), using data from UN Conference on Trade and Development's Trade Analysis and Information System database (TRAINS) database, as well as the World Trade Organization's (WTO) Integrated Data Base (IDB) and Consolidated Tariff Schedules (CTS) database. Data on trade liberalization are taken from Sachs and Werner (1995) and Wacziarg and Welch (2003, 2008). Data on regulatory measures are taken from World Bank (2019a) and UNCTAD (2019).

Figure 3: Unconditional correlations between trade regulatory trade measures, GDP, imports, and trade liberalization



Notes: The graphs show the number of regulatory trade measures depending on GDP (left panel), unadjusted total imports (panel in the middle), and trade liberalization (right panel). Vertical lines represent 95% confidence intervals. Data on GDP is from PWT 9.1, data on import values is taken from UNCTAD (2019). Data on regulatory measures stems from World Bank (2019a) and UNCTAD (2019). Data on trade liberalization is obtained from Sachs and Werner (1995) and Wacziarg and Welch (2003, 2008). The data cover the main episode of liberalization between 1960 and 2000

The starting point in Table 4 in Column (1) is a specification that most closely replicates the fully specified industry-level outcomes reported in Table 3. Column (1) uses lagged levels of GDP per capita and adjusted imports and includes a full set of country fixed effects, year fixed effects, and continent-year fixed effects. We also restrict the sample to the post-2000 period to facilitate comparison with the industry-level results. The estimates strongly resemble the results obtained for the industry level in suggesting that both GDP per capita and adjusted imports are positively and significantly related to the number of regulatory measures. Again, examining the relative importance of these factors against the backdrop of a one-standard-deviation change in the variables suggests that the null hypothesis of an equal influence cannot be rejected. The country-level results and the industry-level results thus both suggest an equal divide between socially beneficial and producer-protecting regulations (before adjustment for regulatory overlap).

Table 4: Diversity of Use of Regulatory Trade Measures---Baseline Regression Results, Count Data Model, Country-Level Results

Dependent variable: Number of regulatory restrictions in use, N_{jt}

	Period 2000 - 2018 (1)	Full Period (1994-2018) (2)	Period (1994-1999) (3)
GDP $(t-1)$	0.092***	0.103***	0.701***
	(0.019)	(0.018)	(0.162)
Imports^{adj} $(t-1)$	0.511**	0.491**	-1.064
	(0.229)	(0.219)	(2.185)
Observations	2,121	2,771	650
Countries	112	112	110
LR / Wald χ^2	1542,7	1743.2	309.93
Pr[LR/Wald $> \chi^2$]	0.000	0.000	0.000
Country fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Continent×Year fixed effects	Yes	Yes	Yes

Notes: The table reports regression results of our count data model on the influence of GDP and adjusted imports on the number of regulatory trade restrictions that are in place at the country-level. Data on GDP is taken from Penn World Tables 9.1, data on import values is taken from World Bank (2019b). Adjusted imports have been calculated as described in Section 5.1. Coefficients on GDP and adjusted imports are multiplied by 1.000.000 to facilitate readability.

*** Significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 1 percent level

The important point here is that the descriptive statistics shown in figure 2 indicate that trade liberalization surged between the mid-1980s and the early 2000s. With the industry-level data used in the baseline estimates, we can only reconstruct the post-2000 period. Column (2) uses the full potential of the country-level data, re-estimating the model of Column (1) for the broadest possible sample of countries and years 1994-2018. While we observe a slight increase in the coefficient on GDP per capita and a slight decrease on the coefficient on 'adjusted' imports, the main outcomes are similar to the results in Column

(1). The results suggest change in the composition of intent of import regulation over time. In Column (3), we show estimates using data only for the pre-2000 period, that is, the period that we cannot reconstruct with industry-level data and during which most trade liberalization took place. Doing so yields a drastic change in the results. In the pre-2000 period, the marginal effect of GDP per capita on the number of trade restrictions is much larger than indicated in the pre-2000 results. Importantly, we do not observe any statistical relationship between 'adjusted' imports and the number of regulations prior to 2000, which provides strong support for producer-protectionist motives not playing a major a role in countries that did not liberalize trade.

Taken together, the results of table 4 suggest that

In the post-2000 period, inferences regarding the relative importance of socially beneficial and producer-protecting intent at the country level resemble the inferences from the industry-inclusive baseline estimates.

This result is highly sensitive to the time period examined:

Comparing pre- and post-2000 periods, producer-protectionist intent increased in the post-2000 period, by which time most countries had liberalized trade. In the period before 2000, socially beneficial intent of import regulation clearly dominates.

The limited availability of data on the industry-level impedes inclusion of additional variables that may correlate simultaneously with the number of regulations and our key explanatory variables. Given that the industry-level estimates include country-year fixed

effects, the probability of an omitted variable bias is however low. To address a potential omitted variable bias of our country-level results, we conduct additional analyses to check the robustness of our estimates. In Table A1 in the appendix, we address the concern of selection on observables. Specifically, we augment our baseline parametrization by

$$\lambda_{jt} = \exp(\alpha Y_{jt-1} + \beta V_{jt-1} + \eta_j + \zeta_t + \psi_c \times \zeta_t + \mathbf{X}_{jt}\boldsymbol{\beta} + \epsilon_{jt}), \tag{16}$$

where $\mathbf{X}_{jt}$ is a matrix that includes covariates that potentially are correlated with the number of regulatory restrictions and our key variables of interest. We account for a nation's population to test for the hypothesis that countries with larger populations and therefore presumably a more diversified palette of traded goods have more regulatory trade measures. Based on a similar argument, we also account for potential effects coming from a larger number of persons involved in trade and production. We also account for cost differentials across countries that influence the propensity to trade by including the exchange rate measured relative to the US dollar. Our augmented model also includes technological progress (measured through total factor productivity) as a proxy for new products that become available and that may change the extensive margin of traded goods. Similarly, more sophisticated technologies may increase the need for technical barriers to trade (TBT). Data on population, employment, exchange rates relative to the US-Dollar, and measures for technological proxies are from Penn World Tables version 9.1. Finally, we account for the number of regional trade agreements (RTAs) entered into by countries. These agreements come with internal rules between member countries, and often include

external rules when dealing with non-member countries. Internal and external rules of RTAs can influence the number of regulatory measures.[24] Augmenting our model by the described control variables has no effect on the main results.

We have combined the two types of regulatory measures in our estimates. A further question is whether our key findings depend on the particular type of regulatory measure. To examine this question, we re-estimated separately for sanitary and phytosanitary restrictions (SPS) and for technical barriers to trade (TBT). The results are shown in Tables A2 and A3 in the appendix. The patterns found in our regressions re-appear with respect to both types of restrictions. The effects are, however, slightly stronger for TBT measures.

6. Protectionist inefficiency and redistribution

Economic theory predicts inefficiency due to producer protection, and also accompanying redistributional effects, as through the Stolper-Samuelson theorem or the specific-factors model of international trade. Our aggregate data hide heterogeneity in effects across individuals. Household-level data from the World Value Survey (WVS) are available with unparalleled coverage of countries, households and years, and also include socio-economic

[24] Data on RTAs were collected from Mario Larch's Regional Trade Agreements Database, which covers RTAs on the country-level for the period 1950 to 2017 and were originally collected in Egger and Larch (2008).

characteristics that affect the financial situation of households. We merge our dataset with the household-level data of the WVS and estimate empirical models of the form

$$HH_{jthw} = \alpha N_{jt} + \boldsymbol{X}_{jthw}\boldsymbol{\beta} + \eta_j + \gamma_t + \psi_w + \varepsilon_{jthw}, \tag{17}$$

where HH_{jthw} is the reported financial situation (measured on a scale running from 1 to 10) of households h in country j at year t, as reported in the wth wave of the WVS.[25] The countries included in the WVS differ in various characteristics (development levels, political institutions, historical events, culture and ethnicity). We include country fixed effects η_j to control for these differences. We also control for year fixed effects γ_t and wave fixed effects ψ_w. The financial circumstances of households depend on socio-economic characteristics, which we include in the set of controls variables $\boldsymbol{X}_{jthw}$. Included in the characteristics are level of education, employment status, marital status, age, number of children in household, and the income level. We augment equation (17) with interaction effects between the number of regulatory trade measures and the position of households on their national income distribution, measured through income deciles Φ_{it}:

$$HH_{jthw} = \alpha N_{jt} + \kappa\left(\mathrm{N_{jt}} \times \Phi_{jthw}\right) + \nu\Phi_{jt} + \eta_j + \gamma_t + \psi_w + \varepsilon_{jthw}. \tag{18}$$

[25] The WVS is a large-scale research project, collected in many countries in six waves. The WVS data are representative for about 90% of the global population and were collected between 1981 and 2014 (a seventh wave was being collected at the time of this study).

The results are shown in Table 5. Column (1) reports the results for the full sample of observations for which household data and data on regulatory trade measures were available consisting of 243,768 households from more than 70 countries. The number of regulatory measures is negatively associated with the financial wealth of households. The correlation is statistically significant at the 1% level. Column (2) includes socio-economic controls, which are shown to have little effect on the estimated parameters of regulatory trade measures. The implication is that:

> *As reflected in financial wealth of households, inefficiency imparted through regulatory decisions of regulator 2 outweighs the effects of socially beneficial decisions of regulator 1, suggesting inefficiency overall from the regulatory measures.*

Columns (3) and (4) in Table 5 show the effect of import regulation depending on the income decile of households estimated in equation (18). The effect on the financial circumstances of households remains negative and statistically significant. The negative parameter estimate however suggests a distributional effect:

> *The negative correlation between import regulation and the financial situation of households is particularly large for poorer households.*

The interaction term between the income decile and regulatory trade measures delivers a parameter estimate with positive sign. The estimate is statistically significant once we introduce socio-economic controls (Column 4), suggesting that:

Regulatory trade measures are positively correlated with the financial wealth of better-off households.

The inference is that:

Producer-protecting regulations of regulator 2 give rise to inefficiency and create rents that are benefits to better-off households.[26]

These conclusions assume internalization of import regulation in markets for financial assets and that past incomes from which wealth has been derived have been increased by socially beneficial decisions of regulator 1.[27]

We have found a negative *net* effect of an increase in total regulations on household wealth. Our conclusion regarding inefficiency is about this negative net effect. If *all* regulations were taken away (both socially beneficial and producer-protecting), the net effect on household wealth would be positive. Distributional effects are likewise based on the same net effects.

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[26] Kahana and Klunover (2014) show how inefficiency through deadweight losses interacts with losses incurred through the social costs of rent seeking.

[27] Also implicit are efficiency losses when regulator 1 prohibits imports. With the socially undesirable characteristics of goods embodied in the goods, we confront the question whether there can be gains from trade in socially undesirable goods. This question leads into complexities of paternalistic policies (Hillman 2019, chapter 5). If imports of hallucination-causing substances are banned, how should we relate to the utility of the people who want to use the drugs but cannot do so?

Table 5: Use of National Regulatory Restrictions and the Financial Situation of Households

Dependent variables: Financial situation of the household, HH_{jthw}

	Linear Effects		**Conditional Effects**	
	No Controls (1)	Controls (2)	No Controls (3)	No Controls (4)
N_{jt}	-0.0003***	-0.0002***	-0.0002***	-0.0002***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
$N_{jt} \times \Phi_{jthw}$			0.0001	0.0001*
			(0.0000)	(0.0000)
Φ_{jthw}			0.3619***	0.3368***
			(0.0026)	(0.0029)
Education		0.0357***		0.0357***
		(0.0027)		(0.0027)
Student		0.2400***		0.2573***
		(0.0225)		(0.0225)
Unemployed		-0.4510***		-0.4686***
		(0.0200)		(0.0199)
Widowed		0.151***		0.1836***
		(0.0283)		(0.0281)
Children in HH		-0.292***		-0.3113***
		(0.0156)		(0.0155)
Age		0.0022***		0.0053***
		(0.0005)		(0.0004)
Observations	234,768	190,866	213,500	190,866
R-Squared	0.146	0.248	0.244	0.248
F Statistics	484.3	719.6	842.7	718.6
Country fixed effects	Yes	Yes	Yes	Yes
Wave fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

*** Significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 1 percent level

Notes: Robust standard errors are in in parentheses. Household data is taken from the World Value Survey. Income denotes the position of the household on the national income distribution on a scale running from 1 to 10. Education is the highest level of education obtained. The variable is coded from 1 (inadequately completed elementary education) to 8 (University completed with degree). Student, Unemployed, and Widowed are dummy variables. Children in HH accounts for children in the household of respondents. Age is measured in years.

7. Country diversity

We supplement our empirical results by looking at country diversity in use of import regulations. Tradition and culture can affect international trade (Bala and Long 2005). Beneficial societal protection should not however result in wide differences in the number of regulations in countries with similar GDP per capita (data for which is shown in column 8 of Table 1 for the sample of countries). Low standards for public health and the environment through imports can be dangerous or, depending on the scope for infections and disease, cataclysmic (the covid-19 virus showed how disease can emerge ostensibly through transmutation from animals to people). The scope of dangers from unsafe goods should be the same for Robinson Crusoe alone on his island as for the population of any country. Crusoe is constrained by what he as one person can consume but he is not constrained in what he should *not* consume.

We return now to the sample of countries in Table 1. The U.S. and the EU, as well as Japan, South Korea and China, are shown to have many more regulations than Australia and Switzerland. The extent of diversity in numbers of regulations is not expected, in particular since the WTO and also United Nations agencies promote uniformity in regulation by encouraging harmonization (having countries set identical import

regulations) or coordination (reducing differences in regulatory standards).[28] The diversity among countries in numbers of regulations suggests producer protection rather than, for example, the governments of Australia and Switzerland being lax in protecting consumers and the environment.

Country diversity in use of import regulations suggests producer-protecting intent: the diversity is not expected for societal protection in countries with similar development and per capita income levels.

8. What has happened at the WTO?

If there is producer protection, what has happened at the WTO when governments of member countries have reported their regulatory measures affecting imports? The WTO has not been included when malfeasance has been reported inside international organizations (on which see Dreher and Lang 2019). Yet misuse of WTO rules will have taken place, if import regulations have protected producers. To address how malfeasance arises, a distinction is required between the WTO itself and member-countries'

[28] On WTO guidelines for rules for food safety and animal and plant health standards, see https://www.wto.org/english/tratop_e/sps_e/spsagr_e.htm (accessed 10 April 2020). The Codex Alimentarius sponsored by the FAO and WHO (which are United Nations agencies) promotes uniformity through 'a collection of internationally recognized standards, codes of practice, guidelines, and other recommendations relating to foods, food production, and food safety.' See http://www.fao.org/fao-who-codexalimentarius/en/(accessed 10 April 2020).

governments. Choudhury (2019) observes that the WTO views a country becoming a member as a step to improving the ethics of governance, but concludes using firm-level survey data that, if anything, corruption increased after countries joined the WTO. Bown (2004) studied member-countries' governments as purposefully and opportunistically not adhering to WTO trade agreements.

At the WTO, import regulations reported by governments can be questioned by representatives of governments of other WTO members in 'specific trade concerns' expressed in SPS and TBT committees (see Ghodsi and Michałek 2016; Ghodsi 2018; Beverelli et al. 2019). The 'concerns' can include non-notification by a WTO member of a regulation. Holzer (2018) gives us insight into consequences. She reported with regard to TBT measures that a dispute in the WTO involves 'on average 28 measures and 180 claims, and 13 issues on appeal, with 10,000 words per issue appealed.' Complaints wither. The vast majority of 'concerns' disappear without resulting in a dispute-resolution procedure. Holzer (2018) also reported that of the more than 540 'specific trade concerns' discussed in the TBT Committee of the WTO from 1995 to 2017, only 15 evolved into formal disputes.

When representatives of governments of member countries make the claim that their government's intention is to benevolently protect consumers from unsafe products and sustain flora and fauna and prevent environmental degradation, it can be diplomatically inopportune for representatives of other countries to question the declared benevolence of

intentions. Informal consultations and diplomacy become the primary means of seeking resolution of complaints (Beverelli et al. 2019).

The WTO acknowledges that countries' standards can differ. For SPS measures, a WTO document states that

> "due to differences in climate, existing pests or diseases, or food safety conditions, it is not always appropriate to impose the same sanitary and phytosanitary requirements on food, animal or plant products coming from different countries."[29]

Countries' governments and regulatory agencies are left with broad discretion to set their own standards.[30] Our results suggest that the broad discretion results in producer protection.

9. Concluding remarks

To summarize, import regulations are globally the most prevalent form of trade intervention and are uniquely among means of trade intervention ambiguous in intent. We

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[29] WTO at https://www.wto.org/english/tratop_e/sps_e/spsund_e.htm (accessed May 14 2020.

[30] In the United States, for example, the Food and Drug Administration specifies and oversees regulation of imports including food and drugs, cosmetics, medical devices, radiation-emitting products, vaccines, and animals and veterinary products. See https://www.accessdata.fda.gov/cms_ia/default.html (accessed 16 April 2020). Van Norman (2016) provides a comparison of U.S. and EU regulatory procedures for pharmaceuticals and health-related devices.

have proposed a model that when applied empirically suggests an equal divide in intent of import regulation. Allowing for regulatory overlap converts the estimate to an upper bound for producer protection. Estimation using country-level data encompassing the period of trade liberalization replicates the baseline results and suggests substitution over time of import regulations for tariffs (when the tariffs that were replaced had been unambiguously producer-protecting). Further estimation using household financial-wealth data has revealed inefficiency and redistribution consequences of import regulation that are characteristic of producer protection. Producer protection is suggested by country diversity in use of import regulations. We have considered how WTO procedures might facilitate opportunistic use of regulatory measures.

A final question concerns remedial responses. Could socially beneficial regulation be ensured through a United Nations agency, for example by extending the authority of the International Organization of Standardization? Authority by a United Nations agency is not expected to meet with acceptance by governments, in particular in democracies. Governments would be required to forgo the prerogative of protecting their citizens and the environment from unsafe imports. Inhibitions to supra-national authority are also the failure of the WTO to curb producer-protecting regulation and the evidence that the interests of particular governments and country blocs have been promoted in the United Nations and its agencies rather than the global social good being sought (Vaubel, 2015;

Dresher and Lang 2019; Moser 2020).[31] There is a private-sector incentive for industry self-regulation to ensure a reputation for quality of a country's exports (see Falvey 1989), but self-regulation need not be effective. Administrative corruption (see for example Aidt et al. 2020) would compromise the effectiveness of oversight by foreign administrative agencies of foreign-industry self-regulation.

Relying on our result of an equal divide in intent, random selection from among regulations gives an equal chance of a regulation protecting consumers and the environment or protecting producers. There is consequently a social dilemma of the type of 'your money or your life'. Protected producers take the 'money'. 'Life' is preserved through indispensable regulations that protect public safety, public health, and the environment and within which producer-protecting regulations are embedded.

Heller and Sieberg (2009) have proposed a game in which everyone is dishonest but an equilibrium with 'honesty among thieves' exists if participants punish other thieves, even if the punishers are themselves thieves. The equilibrium of 'honesty-among-thieves' requires dishonest participants to be sufficiently indignant about the dishonesty of others. The equilibrium of 'honesty-among-thieves' is perhaps the best hope for forthrightness in

[31] Fisman and Miguel (2007) provide evidence indicative of disregard for the rule of law among United Nations representatives of countries with high corruption.

regulation of imports. Experimental evidence (Ariely et al. 2019) diminishes expectations, among thieves or more generally.

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Appendix A. Supplementary tables

Table A1: Diversity of Use of Regulatory Trade Measures---Accounting for Potential Confounding Factors, Count Data Model, Country-Level

Dependent variable: Number of regulatory restrictions in use, N_{jt}

	Period 2000 - 2018 (1)	Full Period (1994-2018) (2)	Period (1994-1999) (3)
GDP $(t-1)$	0.136***	0.145***	0.556***
	(0.025)	(0.024)	(0.154)
Imports^{adj} $(t-1)$	0.561***	0.580***	-3.311
	(0.193)	(0.223)	(3.633)
Total Population	-0.001	0.001	-0.018
	(0.001)	(0.001)	(0.016)
Total Employment	0.007*	0.000	0.039
	(0.003)	(0.002)	(0.039)
Exchange Rates	0.0001***	0.0001***	0.0001
	(0.000)	(0.000)	(0.000)
Technological Progress	0.014***	0.016***	0.044***
	(0.002)	(0.002)	(0.009)
Regional trade Agreements	-1.146***	-1.119***	0.151
	(0.309)	(0.269)	(1.164)
Observations	1,618	2,149	531
Countries	112	112	110
LR / Wald χ^2	1033.6	1171.7	320.9
Pr[LR/Wald $> \chi^2$]	0.000	0.000	0.000
Country fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Continent×Year fixed effects	Yes	Yes	Yes

Notes: The table reports regression results of our count data model on the influence of per capita GDP and adjusted imports on the number of regulatory trade restrictions in place. Total Population denotes the total population (in millions) living in a country at time t. Total Employment denotes the number of persons employed (in millions) in a country at time t. Exchange Rate is the rate of the currency of countries relative to the US-Dollar. Technological Progress denotes TFP at constant national prices (2011 = 1). Regional trade Agreements (RTAs) are agreements signed by countries. Data for Total Population, Total Employment, Exchanges Rates, and Technological Progress are from Penn World Tables 9.1. Data on RTAs are from Mario Larch's Regional Trade Agreements Database, which covers RTA on the country-level for the period 1950 to 2017 and was originally collected in Egger and Larch (2008). Coefficients on GDP and adjusted imports are multiplied by 1,000,000 to facilitate readability.

*** Significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 1 percent level

Table A2: Diversity of Use of Regulatory Trade Measures--- Sanitary and phytosanitary measures (SPS), Count Data Model, Country-Level

Dependent variable: Number of regulatory restrictions in use, N_{jt} (SPS only)

	Period 2000 - 2018 (1)	Full Period (1994-2018) (2)	Period (1994-1999) (3)
GDP $(t-1)$	0.041*	0.050**	1.011***
	(0.023)	(0.022)	(0.217)
Imports^{adj} $(t-1)$	0.654**	0.562**	-3.489
	(0.279)	(0.283)	(2.267)
Observations	2,271	2,962	691
Countries	112	112	110
LR / Wald χ^2	1216.6	1408.0	257.5
Pr[LR/Wald $> \chi^2$]	0.000	0.000	0.000
Country fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Continent×Year fixed effects	Yes	Yes	Yes

Notes: The table reports regression results of our count data model on the influence of GDP and adjusted imports on the number of regulatory trade restrictions in place at the country-level. Data on GDP are from Penn World Tables 9.1; data on import values are from World Bank (2019b). Adjusted imports have been calculated as described in Section 4.1. Coefficients on GDP and adjusted imports are multiplied by 1,000,000 to facilitate readability.

*** Significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 1 percent level

Table A3: Diversity of Use of Regulatory Trade Measures--- Technical barriers to trade (TBT), Count Data Model, Country-Level

Dependent variable: Number of regulatory restrictions in use, N_{jt} (TBT only)

	Period 2000 - 2018 (1)	Full Period (1994-2018) (2)	Period (1994-1999) (3)
GDP $(t-1)$	0.129***	0.139***	0.779***
	(0.020)	(0.019)	(0.197)
Imports^{adj} $(t-1)$	0.852***	0.749***	-1.413
	(0.254)	(0.237)	(2.255)
Observations	2,428	3,166	738
Countries	112	129	112
LR / Wald χ^2	1387.6	1580.3	429.3
Pr[LR/Wald $> \chi^2$]	0.000	0.000	0.000
Country fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Continent×Year fixed effects	Yes	Yes	Yes

Notes: The table reports regression results of our count data model on the influence of GDP and adjusted imports on the number of regulatory trade restrictions that in place at the country-level. Data on GDP is taken from Penn World Tables 9.1; data on import values is taken from World Bank (2019b). Adjusted imports have been calculated as described in Section 4.1. Coefficients on GDP and adjusted imports are multiplied by 1,000,000 to facilitate readability.

*** Significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 1 percent level