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Market Power and Commodity Prices: Brazil, Chile and the United States, 1820s-1930

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Market Power and Commodity Prices: Brazil, Chile and the United States, 1820s-1930[1]

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There has been a large number of recent contributions trying to explain the long-term trends of tariff levels in different economies and the links between protection and growth.[4] Concern here is on extending the list of factors that might explain different tariff histories rather than on the tariff-growth controversies, although there might be important implications in the proposed revision of factors affecting tariffs which might improve the understanding of growth performance under different protectionist scenarios.[5] Attention is focused on the analysis of long-term protection in two big Latin American economies using the much better studied case of the United States as a counterpoint. Arguments presented here may also affect the explanation of variations in levels of protectionism in other regions besides Latin America.

In this recent literature surprise has been expressed on the high level of nominal tariffs in Latin American tariffs much earlier than suggested by those who used to single out the 1928-1933 depression as a watershed marking the transition to a period of higher protection. Indeed, in the last quarter of the 19th century, levels of protection were already rather high and remained so, especially in Brazil and Colombia. Political economy reasons have been advanced to stress that this might be expected as in Latin America economic policies favoured the protectionist interests of urban capitalists and that landowners have never managed to dominate national politics.

While having the virtue of drawing general attention to the rather early high level of tariffs in Latin America, this literature fails to take into account essential factors which might have been important to explain the level of tariffs. The focus here is on market

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[3] Department of Economic History, London School of Economics.
[4] See Coatsworth and Williamson (2004) and Clemens and Williamson (2001).
[5] Irwin (2002) has stated the case that there is no causal link between tariff and growth as suggested by O'Rourke (2000) and Clemens and Williamson (2001), stressing the importance of outliers and that land-abundant countries (only Argentina and Canada mentioned) relied on tariffs for revenue purposes.

power by certain countries in specific commodity markets as a crucial factor in the explanation of the history of protection. In the same way that an export tax on the commodity exported by a price maker affects the world price of such commodity, import taxes on inputs used to produce commodity exports affect the world supply of the commodity via marginal cost conditions with a similar consequence on world commodity prices.[6] A high level of import tariff has thus rather different implications in a small economy which is a price taker in the world export markets and in a "big" economy which has market power in the relevant world market. In an economy which is big in a commodity market, there might be also different possible combinations of export taxes on the relevant commodity and import taxes on imported inputs. This suggests that import and export taxes should be considered jointly. It may also be mentioned that there are significant measurement problems related to long-term data on tariffs computed as a ratio between tax revenue and value of imports as import trade statistics in Latin America were based on official prices until a rather late period. This significantly affects estimates of average tariff levels for several Latin American big economies. If this is corrected by computing the value of export trade of main partners using a Morgenstern-type methodology it can be shown that tariff levels were significantly smaller than suggested in the literature for most big Latin American economies at least until the turn of the 19th century.[7]

Interpretations based on the political economy of protection which have been proposed in this literature on the relative influence of a supposedly liberally inclined landowning class and the emergent industrialists also seem unsatisfactory.[8] The assertion that Latin American economic policies favoured protectionist interests of urban capitalists and that landowners have never managed to dominate national politics certainly cannot be generalized. This is most clear when the evidence on Brazil is taken into account, possibly due to the fact that, oddly enough, most analyses have simply

[6] Abreu and Bevilaqua (2000) discussed this hypothesis for coffee and Brazil. Fernandes (2002) extended the treatment to cover also rubber, cotton and saltpetre for Brazil, the United States and Chile, respectively.
[7] See Morgenstern (1963), ch. IX. See Abreu (2004), Table 2, for tariff estimates based on partner export statistics for Argentina, Brazil, Chile, Colombia and Mexico for 1880, 1900, 1913 and 1928. See Estevadeordal (1997) for a discussion of biases affecting different measures of protection for most European economies, Argentina, Australia, Canada and the United Sates in 1913.
[8] Coatsworth and Williamson (2004), pp. 53 and ff.

abstained from dealing with the history of protection in this particular economy, even if noting how high its tariff was. For a country where coffee stockpiling took place under the auspices of the Federal government since 1907, then again in the 1920s, and then in the 1930s to face the collapse of world coffee prices, the assertion that landowning interests never managed to dominate national politics – and economic policies – seems unwarranted. The theme of possibly opposing interests between coffee and industrial interests in Brazil before the 1928-1933 depression has been the subject of copious literature which stresses that it was rather a question of coffee and industry rather than of coffee versus industry.[9] Evidence shows that a high proportion of industrialists were in fact diversifying coffee growers. In any case, given that Brazil could use its market power to shift the impact of the tariff to world coffee prices any proposed conflict of interests between coffee and industry would lose much of its importance.

In other big Latin American economies such as Argentina the evidence also does not fit easily with the interpretation that economic policies favoured protectionist interests of urban capitalists and thus the tariff was high. The average tariff was not still higher because landowners were unwilling to face increased costs of imported inputs which would entail either an erosion of mark-ups or a loss in market share as they had no market power as suppliers of food. Much of the protection was concentrated on mass-consumption items such as wine and sugar produced domestically in Mendoza and the Northwest.[10]

In the next section the links between commodity prices, export taxes, import tariffs and commodity price support are analyzed for economies with market power in the supply of their main commodity exports. In section 2 it is argued that three countries have to a varying extent met the above conditions: the United States during antebellum cotton period (1826-1859), Brazil for coffee (1880-1930) and rubber (1880-1912) and Chile for saltpetre (1880-1930). Other economies could possibly qualify but there are difficulties preventing their inclusion. For instance, there is no reliable information on Peru as a

[9] Dean (1969) is the standard reference on the subject.
[10] Solberg (1987), p. 106 points out that in Argentina before 1930 there was a "relative absence of concerted government support of industrialization".

supplier of guano before 1880. In India, in second half of the 19th century, the tea producing sector was not as significant part of the economy as in the other cases. Section 3 is on the basic model used to test the hypothesis whether there is a link between the level of tariffs and the price of commodities in the selected economies. In section 4 the empirical results are presented and discussed. The final section concludes.

1. Market power and commodity prices

The initial focus here is on the link between import tariff and commodity prices in cases where specific economies had market power in the markets for such commodities. Several such economies existed in different moments of world economic history. Most of them were rather backward at the time the right conditions applied. They had market power in specific commodity markets as they produced a significant share of the world output of such commodities. The commodity-producing sector was important in the domestic economy as a whole. Had this not been the case, other factors might significantly weaken the link between import tariff fluctuations and the world price of the specific commodity produced by this economy.

The issue of how market power of the United States in the world cotton market might have justified an optimal import tariff in the United States has been the subject of controversy. Taussig (1931) had argued that the United States' import tariff improved the terms of trade due to market power in the world raw cotton market. James (1981) used a simplified computable general equilibrium model to show that, since the United States was a dominant world supplier of cotton, the high U.S. tariff improved the United States' terms of trade. Harley (1992) has pointed problems with this approach and argued, using a modified CGE model, that improvement in the terms of trade resulted from poor specification of the rest of the world and that the tariff had no important terms of trade effects because the United States' marginal export was food not cotton. In the world food market the United States was a minor supplier and international demand for United States food was elastic. Hence, the United States possessed market power in raw cotton but the

tariff could not exploit it because at the margin the country faced an elastic demand curve.

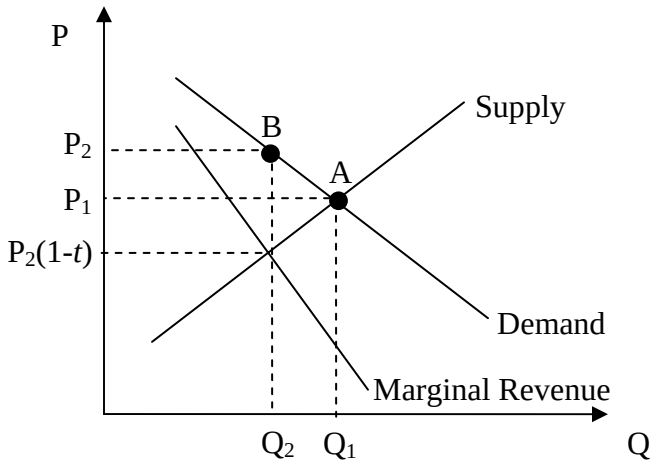
Due to data limitations it does not seem a promising approach to build up CGE models for Brazil and Chile before the mid-20th century. As initial interest here is on the links between import tariffs and commodity prices, and in most of the developing economy cases the relevant commodity answers for a very high proportion of total exports, it makes sense to follow Irwin (2003) and focus the analysis on the microeconomics of monopolist commodity producers. Figure 1 shows such an export market in partial equilibrium. Point A corresponds to equilibrium in the absence of an agreement to restrict exports: perfectly competitive domestic producers of the relevant commodity would sell the quantity Q_1 where export supply equals export demand at the world price P_1. The optimal quantity of exports is Q_2 which corresponds to the point at which the marginal cost of export supply equals the marginal revenue from exports. This is simply the case when the country behaves as a monopolist in world market. As suggested by Irwin the government could ensure that this quantity is exported by imposing a tax so that the price received by domestic producers equals marginal cost at the quantity Q_2. Irwin has cotton in the United States in mind and is concerned with the counterfactual imposition of an export tax.[11]

But there are alternative ways of affecting supply conditions besides export taxes. Tariffs on imported inputs affect the marginal cost conditions in the commodity export sector and thus the supply schedule. The government can ensure that point B is reached by a combination of an export tax on the commodity and import taxes on inputs used in the commodity producing sector. But there is still another type of instrument that ought to be mentioned. Price support policies based on stockpiling have been adopted in countries with significant market power in commodity markets where supply could not be easily restricted.[12] The most important examples were the Brazilian coffee "valorisation"

[11] The US Constitution has always prohibited the imposition of export taxes.
[12] Different types of barriers to entry were levied in order to guarantee control over supply. For instance, the Chilean government devised a system of mining licenses, whereas, following the *Convênio de Taubaté* in 1906, new coffee plantations in Brazil were restricted.

schemes from 1907 to the early 1960s. Transition from point A to point B in the more complete case could then depend on a combination of policies which included import and export taxes and price support.[13]

Figure 1



In the simpler case of an optimal export tax, *t* would be simply the reciprocal of the price elasticity of the commodity export demand. Following Irwin (2003), the marginal revenue of commodity exports can be expressed as $P^*\left(1-\frac{1}{\eta_d}\right)$, where P^* is the world price and η_d is the (positive) elasticity of demand for the country's exports. Since commodity's domestic price would be given by $P = P^*(1-t)$, equating marginal revenue to the domestic price yields the optimal export tax: $t = 1/\eta_d$. In the more general case, where the export tax coexists with an import tax on inputs and commodity valorisation, one may think of *t* being substituted by *T*, where *T* is the market intervention required to make the specific commodity market to be exploited with full utilisation of market power through a diversity of instruments.

[13] The government can also internalise monopoly profits, as Peru did in the late 1870s, when it purchased nitrate companies.

2. Commodity-country pairs

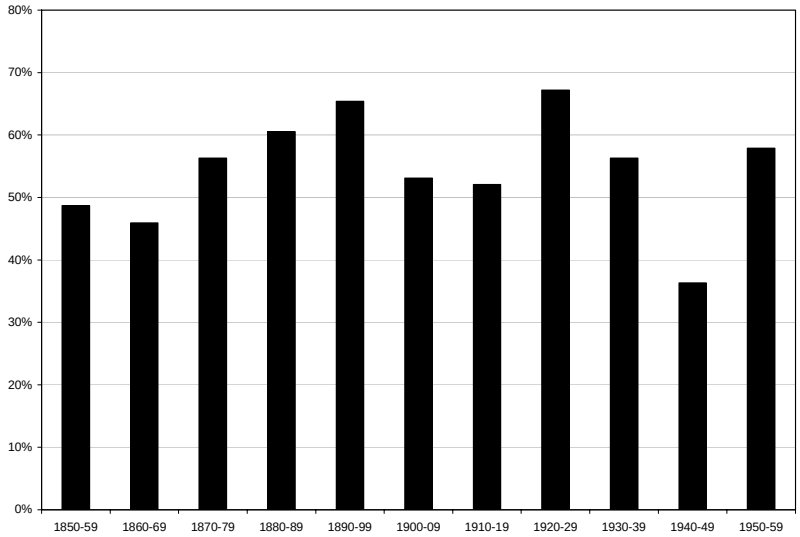
Coffee-Brazil

Brazilian coffee exports in the 19th century grew in line with world coffee consumption. The pace of growth was very fast at the beginning of the nineteenth century: four-fold in volume in the 1820s, two-fold in the 1830s and 1.7 times in the following decade. From 1851-1855 to 1901-1905 the volume of coffee exported grew at the yearly rate of 3.2%.[14] The share of coffee exports in total Brazilian exports was already almost 50% in 1850 and rose to almost 70% in the 1890s and 1920s. It fell below 40% only in the 1940s (see Figure 2).

Brazil captured a significant share of the world coffee market: it hovered around 50% from mid-19th century until the 1890s, then, after peaking in 1900s at more than 80% it hovered around 70% until the early 1930s, steadily declining afterwards (see Figure 3). Brazil's share of world's coffee production was still higher than the share in world exports as stockpiling was adopted as a policy after 1907 and very significant coffee stocks were destroyed in the 1930s and early 1940s. The coffee exports-GDP ratio was around 9% in 1850 and reached more than 10% in 1900 and 1913. In 1928 it was slightly above 9%, but it fell with the collapse of coffee prices and diversification of the Brazilian economy to 4.8% in 1939.[15]

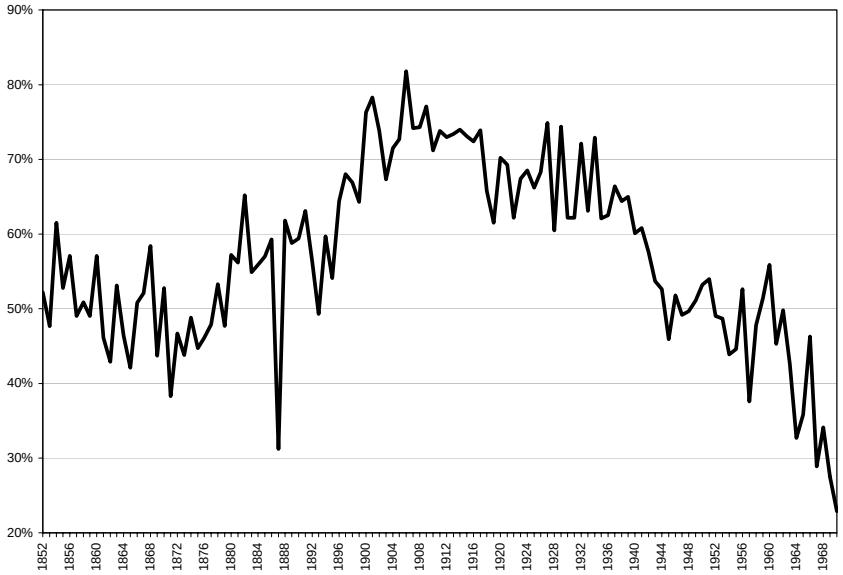
[14] See Abreu and Bevilaqua (2000).
[15] See Abreu and Bevilaqua (2000), p. 37.

Figure 2
Brazil: share of coffee exports in total exports, 1850-59 to 1950-1959



Source: Abreu and Bevilaqua (2000).

Figure 3
Brazil: share in world coffee exports, 1852-1970



Fonte: Bacha and Greenhill (1992).

Rubber-Brazil

The case of Brazil as an export economy with market power is particularly complex because there was a second commodity besides coffee that qualifies for inclusion. Rubber production became an important economic activity in Brazil towards the end of the 19th century. Rubber exports were more than 14% of total exports in the 1890s and a quarter of total exports in the 1900s. After peaking at 39% in 1910 this ratio fell rapidly in the following years as a consequence of Southeast Asian competition and was already under 3% in the 1920s. The Brazilian rubber golden age can be dated from the mid-1880s when exports exceeded the £1 million mark to 1912 when a peak of more than £16 million was reached. The Brazilian share in the world rubber market fell from the 50-60% level of the 1890s and 1910s to less than 10% in 1919. Peak rubber exports were almost equivalent to those of coffee, but in less exceptional years during the boom in the 1900s rubber exports were between a third and a half of coffee exports.[16] The relatively short period during which Brazil had market power in the world rubber market makes it particularly difficult to obtain meaningful econometric results in contrast with analysis based on other country-commodity pairs.[17]

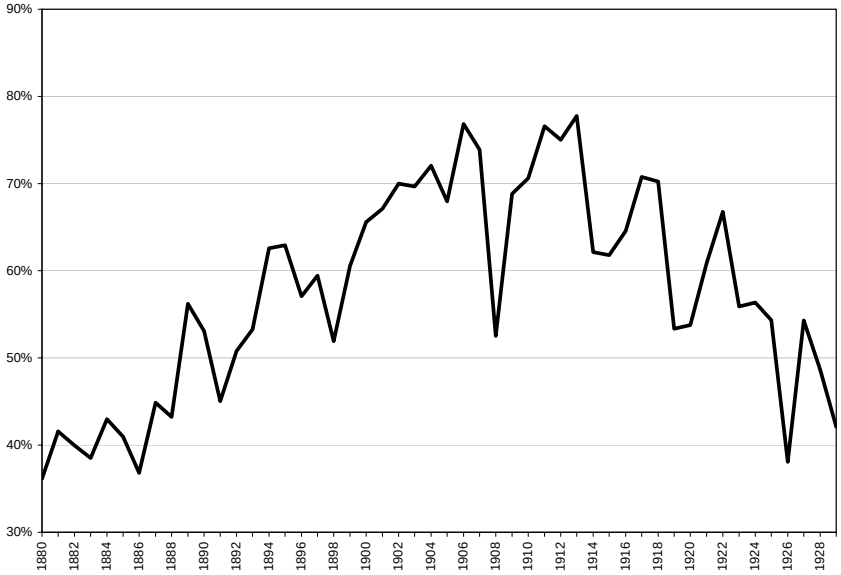
Saltpetre-Chile

Chile, following the 1879-1883 Pacific War against Bolivia and Peru, obtained additional areas in the North which included valuable saltpetre mines that had become the main source of nitrates as guano reserves mainly in Peru were exhausted. The share of saltpetre exports in total Chilean exports rose from less than 40% in 1880 to a peak of almost 80% in the late 1900s and early 1910s, decreasing thereafter. Saltpetre lost ground in Chile's exports due to the fact that synthetic substitutes started to undermine the country's dominance in the world market. In the second half of the nineteenth century, Chilean saltpetre accounted for about 70% of the world supply of nitrogen fertiliser[18] and, on the verge of the World War I, 51.6% of the world fertiliser production came from

[16] LeCointe (1922).
[17] See Fernandes (2002) for an attempt to explain the links between rubber prices and tariffs.
[18] Greenaway *et al*. (1978: 571).

Chilean saltpetre.[19] Fixed nitrogen was required not solely as a fertiliser but was also of prime national importance in the production of explosives. Even though efforts were concentrated to devise a method for chemically combining atmospheric nitrogen, only long after the discovery of the Haber-Bosch process, a commercial synthetic method became economically viable.[20] But that process was not adopted by other countries until the 1920s and, by 1930, only half of the world production of fixed nitrogen was by ammonia synthesis. After 1930 Chilean nitrate lost market share for chemical substitutes which led the country to account for only 1-2% of the world supply of nitrogen fertiliser in the 1960s.[21]

Figure 4
Chile: Share of saltpetre exports in total exports, 1880-1930



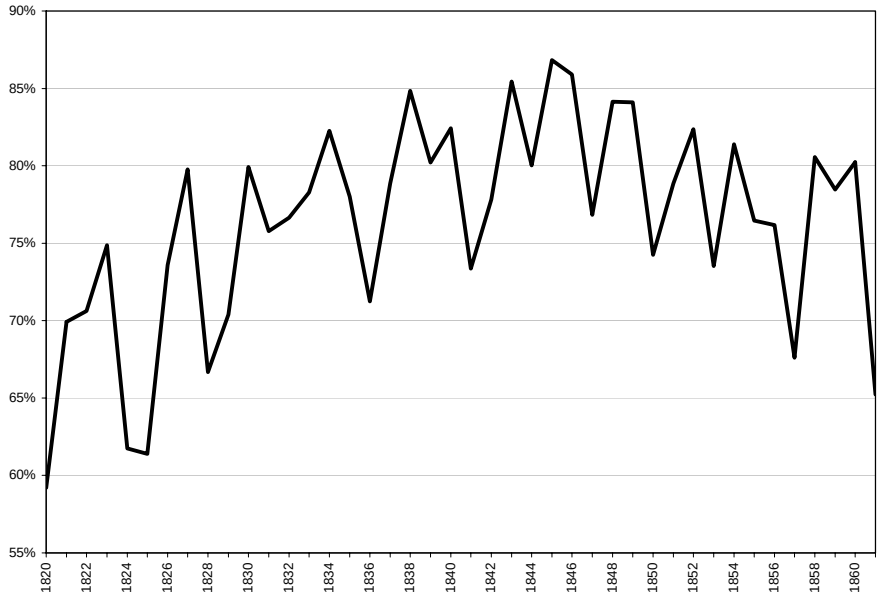
Source: Sutter & Sunkel (1990) and Braun et al. (2000).

[19] Sutter and Sunkel (1982), figure for 1914.
[20] Greenaway *et al*. (1978). Competition stiffened from 1880 onwards due to two chemical substitutes: product nitrogen (being mainly sulphate of ammonia) and synthetic nitrogen. The former was a by-product of coal distillation in the manufacture of coke and artificial gas whereas the latter was produced by capturing nitrogen out of the air using three methods: the arc, cynamide or Haber-Bosch process. Even though product nitrogen was a serious competitor of Chilean's saltpetre by 1914, only in the late 1920s, the Haber-Bosch process became the single largest source of non Chilean nitrogen (O'Brien, 1989).
[21] Greenaway et al. (1978: 572).

Cotton-United States

Cotton in the first half of the 19th century was produced mainly in plantations in the South of the United States which combined ample supply of good quality land and slaves with location advantages in terms of access to the British market. Between 70 and 85% of British antebellum cotton imports originated in the United States (Figure 5). Cotton exports as a share of US exports, however, started to lose importance before the Civil War: after reaching a peak around 55-60% in the late 1830s and early 1840s they fell to the 35-45% range in the second half of the 1850s (Figure 6). Compared to Brazil and Chile, the US economy was much more successful in diversifying its exports.

Figure 5
United States: cotton market share in the British market, 1820-1861



Source: Mitchell & Deane (1971).

Figure 6
United States: share of cotton exports in total exports, 1821-1860

Source: United States (1975).

3. Market Power and Prices

Since the commodities analysed here can be easily stored (leading to systematic mismatches between supply and demand) and production may respond to prices with a lag, the standard model where supply and demand are functions of current prices and determine the market price through a clearance condition does not seem appropriate.[22] Standard reduced form equations for the determination of cotton, coffee and saltpetre prices (PRICE, in equation (1) below) were estimated in order to test the empirical relevance of the hypothesis that significant market shares in international markets of coffee, saltpetre and cotton by exports from the USA, Brazil and Chile respectively implied that domestic variables were relevant for the determination of the world prices of their corresponding exported commodity.

Besides the lagged commodity price, which captures the inertia of the price formation system, another important explanatory variable is market pressure (MARKET), which is constructed as the ratio of world commodity consumption to the sum of world

[22] De Vries (1975). The specifications discussed here build up on previous work presented in Abreu and Bevilaqua (2000) and Fernandes (2002).

commodity production and its corresponding stocks and is intended to capture supply-demand balance in the world market.

Costs related both to domestic and imported inputs are relevant in commodity price determination. Domestic costs refer to inputs produced domestically and used in the production of the commodity or consumed in the economy. External costs encompass all imported inputs used in the production process or consumed in the economy. The domestic price level (divided by the nominal exchange rate) has been used as a measure of internal costs (INTERNAL_COST). The British price level or import prices in the commodity exporting countries (WORLD_COST) and the import tariff (TRF_IMP) have been used to define external costs. In the cases of Brazil-coffee and Chile-saltpetre an export tariff (TRF_EXP) has been included as an explanatory variable. As mentioned earlier, export tariffs were explicitly forbidden by the United States Constitution. Time lags in explanatory variables varied depending on lags between the decision to expand output and actual increase in production which could be as long as five years in the case of coffee.

The more complete specification would be of the following form:

$$\mathbf{PRICE}_t = C + \beta_1\mathbf{PRICE}_{t-d} + \beta_2\mathbf{MARKET}_{t-d} + \beta_3\mathbf{WORLD\_COST}_{t-d} + \beta_4\mathbf{INTERNAL\_COST}_{t-d} + \beta_5\mathbf{TRF\_IMP}_{t-d} + \beta_6\mathbf{TRF\_EXP}_{t-d} + \Theta_t$$

However, the estimated equations had a slightly different specification with a new variable called import cost (ICV) in substitution of the import tariff and the world price level. This new variable reflects the cost of imported inputs for the national producer and was constructed as the multiplication of the import tariff and the world price level. The reason to justify the use of this variable is that there is an inverse relationship between the price of commodities and the world price level, as shown in Table 3.1 below.

Table 3.1: Relation between import tariff and international prices

	Coffee* 1880-1929		Cotton* 1826-1858		Saltpetre 1880-1929	
	Coeff.	P-Value	Coeff.	P-Value	Coeff.	P-Value
C	0.28	1.62%	0.26	9.30%	0.05	43.67%
IMPORT TARIFF(-1)	0.78	0.00%	0.88	0.00%	0.82	0.00%
EXTERNAL PRICE	-0.04	2.54%	-0.05	9.81%	0.00	72.65%
R-squared	80.8%		83.0%		68.5%	
Adjusted R-squared	80.0%		81.9%		67.2%	
Included Observations	49		32		49	
Durbin-Watson stat	1.70		1.81		1.67	

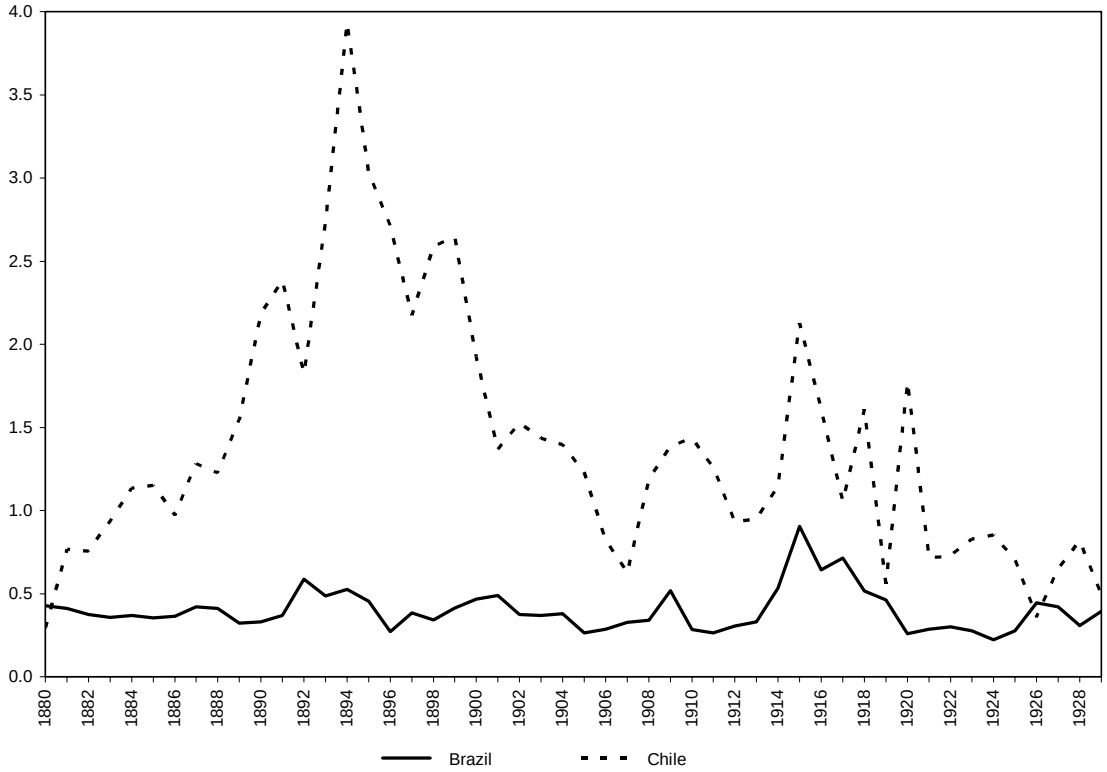
Source: See Appendix.

* Estimated using Newey-West Standard Errors and Covariance Adjustment.

That negative relationship between the two components of ICV is likely to be related to the fact that the government aims at a given revenue target. If import prices rise, import tariff rates can be lowered and conversely. In the case of coffee and saltpetre the negative relation is more complicated due to the existence of an export tariff as well. Therefore, the government could achieve its target level of revenue through a combination of import and export tariffs. The non-significance of external prices in saltpetre equation suggests that Chilean government relied more heavily on export tariffs than Brazilian government did. This is confirmed by the fact that exports taxes *vis-à-vis* import taxes were relatively much more important in Chile than in Brazil in almost every year from 1880 to 1930 (see Figure 7 below), principally at the beginning of the sample.[23]

[23] It should be stressed that in Brazil, with the advent of the Republic in 1889, export tariffs were transferred to the control of the states while the import tariff remained in the hands of the Federal Government. This makes the comparison between export taxes and import taxes more difficult in the case of Brazil. Since the import rights/total revenue ratios cannot be used because the definition of total revenue would be different for Brazil (Federal plus States) and Chile (only Federal), the only way of comparison is through total export and import revenues in both countries. From 1880 to 1889, the comparison is fair. However, from 1889 on, there would be relevant missing data since there are data only for export revenues from São Paulo State: there are no reliable data for Minas Gerais (also mainly on coffee), Amazon and Pará (rubber) and Rio de Janeiro (the main harbour of Brazil). In order to tackle this problem, it was decided to calculate São Paulo export tariff excluding valorisation rights. This export tariff was then multiplied by Brazil total exports to obtain an estimate for Brazil export revenues to which valorisation tax proceeds collected only in São Paulo were added. This series was then compared to Brazil import revenues.

Figure 7
Brazil and Chile: ratio of export rights and import rights, 1880-1930



Source: Diaz and Wagner (2004) and Brasil (1941), Brasil (1990), Fritsch (1988), Annuario Estatístico de São Paulo (several issues), Mappas Estatísticos do Commercio e Navegação do Porto do Rio de Janeiro (several issues), Balanço, Receita e Despeza do Império (several issues), Receita e Despeza da República (several issues), Report of Her Majesty's Secretaries of Embassy and Legation (1884), Mensagens Presidenciais da Província de São Paulo (several issues) and Relatório da Fazenda do Estado de São Paulo (several issues).

Analysis of the relation between commodity prices and export tariffs (see Table 3.2) also suggest an inverse relationship, more intense in the case of Chile-Saltpetre than for Brazil-Coffee.

Table 3.2: Relation between export tariffs and commodity price

	Coffee* 1880-1929		Saltpetre 1880-1929	
	Coeff.	P-Value	Coeff.	P-Value
C	0.05	4.35%	0.27	0.00%
EXPORT TARIFF(-1)	0.78	0.00%	0.66	0.00%
COMMODITY PRICE	-0.01	12.99%	-0.06	0.00%
R-squared	69.8%		82.7%	
Adjusted R-squared	68.5%		82.0%	
Included Observations	49		49	
Durbin-Watson stat	1.51		2.17	

Source: See Appendix.

* Estimated using Newey-West Standard Errors and Covariance Adjustment.

4. Empirical results and model adjustment

The adjusted specification to take into account the comments included in the previous section would then be:

$$\mathbf{PRICE_t = C + \beta_1 PRICE_{t-d} + \beta_2 MARKET_{t-d} + \beta_3 INTERNAL\_COST_{t-d} + \beta_4 ICV_{t-d} + \beta_5 TRF\_EXP_{t-d} + \Theta_t}$$

The above equation was estimated for coffee (1880-1930), cotton (1826-1858) and saltpetre (1880-1929) and the results are shown in the Table 3.3 below. All fits were quite good. Coffee price is explained by its one and two-year lags, market pressure and *ad valorem* import tariff both with a 5-year lag.[24] All coefficients are statistically significant at least at the 10% confidence level, except market pressure which is only significant at the 15% confidence level. It is worth noticing that the ICV-elasticity of coffee price is 0.38, suggesting that Brazilian coffee growers were successful in passing through increases of the level of protection to the price of coffee.

The cotton price equation also corroborates the hypothesis of a link between the cost of imported inputs and the price of cotton. As it can be seen from the Table 3.3 below, cotton price is explained by its one-year lag, ICV and market pressure also lagged one year and the current price of slaves. All coefficients show the expected sign and are

[24] The reason for the five year lag is that in the relevant period production started 5 years after coffee trees were planted (Rowe, 1936: 37).

statistically significant at least at the 10% confidence level, with the exception of ICV's, which is only statistically significant at 15% confidence level. It should also be emphasised that cotton was the only commodity in Table 3.1 for which internal costs (measured by slave prices) were a relevant explanatory variable of cotton price. For coffee and saltpetre, series of internal prices and/or wage level were used without success.

Saltpetre price equation showed the best fit and as in the case of cotton and coffee, all coefficients showed the expected sign and were statistically significant at least at the 15% confidence level. In fact, the ICV coefficient is statistically significant at 1% confidence level. However, due to the lack of a series of stocks, the saltpetre equation does not contain a variable to capture market pressure.[25] It is worth noting that the Breusch-Godfrey Lagrange multiplier test for up to three-order ARMA errors was applied for all equations presented in Table 3.3 and serial correlation was ruled out through the use of lags of the dependent variable.

Table 3.3: Commodity price equations excluding export tariffs: coffee, cotton and saltpetre, 1826-1929

	Coffee 1880-1929		Cotton 1826-1858		Saltpetre 1880-1929	
	Coeff.	P-Value	Coeff.	P-Value	Coeff.	P-Value
C	-1.40	7.91%	-4.92	0.16%	-0.73	6.22%
PRICE(-1)	0.88	0.00%	0.29	7.52%	0.38	0.24%
PRICE(-2)	-0.26	7.45%	-	-	-	-
ICV(-1)	-	-	0.26	14.04%	0.48	0.00%
ICV(-5)	0.38	0.80%	-	-	-	-
MARKET(-1)	-	-	0.60	0.16%	-	-
MARKET(-5)	0.31	12.55%	-	-	-	-
SLAVEPRICE	-	-	0.30	6.67%	-	-
R-squared	71.8%		72.4%		79.4%	
Adjusted R-squared	69.0%		68.3%		78.5%	
Included Observations	45		32		49	

Source: See Appendix.

[25] There was an attempt to construct a series of market pressure for saltpetre using the difference between production and consumption and setting an initial level of stocks so that there were no negative stocks in any year ahead. Nonetheless, that variable showed no statistical significance in explaining the price of saltpetre.

The specification whose results were presented in Table 3.3 was expanded to include the export tariff. Results are presented in Table 3.4 except for cotton as there was no export tariff in the United States. Coefficients for the export tariff showed statistical significance and the predicted sign in all equations. While the previous results do not change[26], there are some quantitative implications; the most obvious one being the improvement in the fit of all equations and also in the p-values for all coefficients[27].

Table 3.4: Commodity price equations including export tariffs: coffee, cotton and saltpetre, 1826-1929

	Coffee 1880-1929		Cotton 1826-1858		Saltpetre 1880-1929	
	Coeff.	P-Value	Coeff.	P-Value	Coeff.	P-Value
C	-2.51	0.75%	-4.92	0.16%	-1.35	1.06%
PRICE(-1)	0.92	0.00%	0.29	7.52%	0.47	0.05%
PRICE(-2)	-0.27	5.30%	-	-	-	-
ICV(-1)	-	-	0.26	14.04%	0.51	0.00%
ICV(-5)	0.52	0.09%	-	-	-	-
EXPORT TARIFF(-1)	2.57	3.04%	-	-	0.86	7.70%
MARKET(-1)	-	-	0.60	0.16%	-	-
MARKET(-5)	0.42	3.72%	-	-	-	-
SLAVEPRICE	-	-	0.30	6.67%	-	-
R-squared	75.1%		72.4%		80.8%	
Adjusted R-squared	71.9%		68.3%		79.5%	
Included Observations	45		32		49	

Source: See Appendix.

Firstly, the market pressure-coffee price elasticity increased from 0.31 to 0.42, indicating that market pressure is in fact more important to explain the coffee price level than results in the less complete specification suggested. Secondly, whilst for saltpetre the ICV coefficient did not change in statistical terms, for coffee it increased more significantly so that coffee and saltpetre prices respond similarly to an increase in the

[26] As done for equations presented in Table 3.3, the Breusch-Godfrey Lagrange multiplier test for up to three-order ARMA errors was also applied to all equations of Table 3.4 and any serial correlation in the three equations presented in Table 3.3 was ruled out.

[27] The Likelihood Ratio test was used to verify whether TRF_EXP makes a significant contribution to explaining the variation in the commodity price. In both equations the null hypothesis that the TRF_EXP do not belong to the equations was rejected at a 15% significance level.

import tariff level although with a rather different lag structure. Cotton price is much less sensitive to tariff level variations. Thirdly, export tariff elasticity was much higher for coffee than for saltpetre. In fact, export tariff elasticity in the coffee equation was substantially higher than one. This poses no problem since a reduced model in which price is the dependent variable was estimated instead of the traditional model of supply and demand. It can be shown that the magnitude of the export tariff elasticity in the reduced form depends on how much the export tariff-supply elasticity is higher than the price-demand elasticity, there being no requirement that our estimate should be below 1.

Producers of coffee and saltpetre responded more to export tariffs than they did to internal costs and market pressures. This might have happened due to the fact that export tariff is the more direct instrument the government had for changing marginal costs and then the easiest one for producers to measure and pass through. Nonetheless, comparing coffee and cotton equations, it can be inferred that cotton price responded more to market pressures than to internal costs whereas coffee price did the opposite. This result is in line with findings that United States could not have exploited fully its market position due to the fact that it faced an elastic demand curve at the margin as it was a price taker for food exports.[28] Conversely, Brazilian government might have been more successful in changing marginal costs via import tariff increases.

Conclusions

The paper focused on market power by certain countries in specific commodity markets as a crucial factor in explaining the history of protection. It was argued that a country which is a price maker in the world market of a specific commodity might affect the world price of this commodity through three main mechanisms: export taxes, import taxes on inputs used to produce the exported commodity and commodity stockpiling. Previous analyses on the explanation for the high level of protection in specific economies, especially in Latin America, should be revised since they did not take into account market power of each country in commodity world markets.

[28] Harley (1992).

There is strong evidence to support this hypothesis. Standard reduced form equations for the determination of cotton, coffee and saltpetre prices were estimated in order to test if significant market shares in international markets of coffee, saltpetre and cotton by exports from the USA, Brazil and Chile, respectively, implied that domestic variables were relevant for the determination of the world prices of their corresponding exported commodity. Econometric results suggest that those countries were successful in passing through increases in internal costs to the world price of their respective exported commodity.

The political economy of protection in those countries was somewhat different from what was normally observed in a price taker country. Whenever an internal lobby succeeded in increasing the level of protection, there would be not such a strong incentive from exporters to lobby for the reestablishment of the initial status quo since they could at least partly pass through the increase in their costs to the final consumer. These qualifications would probably be even stronger in economies such as Brazil where it is difficult to distinguish between export interests and interests focused on import substituting industries.

Different national experiences indicate different combinations of instruments which could be used to move an economy towards equilibrium where market power would be fully exploited. In Brazil, all three instruments have been used: export taxes, import taxes on inputs and stockpiling. In Chile, only export taxes and import taxes on inputs, and in the United States only import taxes on inputs.

There are sharp contrasts between the production processes of coffee, saltpetre and cotton. In the relevant period a coffee tree became productive only five years after it was planted. Cotton was planted every year. Saltpetre rate of production was flexible within certain limits: there was indivisibility related to mining capacity, but no insurmountable constraints on adjustments to reduce output. Once coffee trees were in production the coffee industry was like an industrial line of production whose output was

invariant, given weather conditions (no frosts) and current expenditures on maintenance of the trees in good shape. This to a large extent explains why stockpiling was relevant for coffee as this was the only way to regulate supply flows to demand. Saltpetre producers could almost always adjust the rate of output. Cotton growers could adjust each year how much cotton they wished to plant.

Export taxes were not constitutionally allowed in the United States allegedly because the South feared the imposition of an export tax on cotton.[29] They were relatively more important in Chile than in Brazil and this might have been linked to the fact that they were provincial taxes in Brazil for most of the period while import taxes were a large share of central government revenues. Attention should also be drawn to the fact that costs of coordination of output decisions were much lower for saltpetre – and in principle for cotton – than for coffee producers as there were only a few *salitreras* in Chile[30] and tens of thousands of coffee growers.[31]

The paper does not discuss welfare implications. This should be the subject of further research. The countries analysed here were dominant producers of specific commodities. The imposition of import taxes generated a deadweight loss due to distortions in production and consumption but these were outweighed by price increases entailed by higher prices paid by consumers who bore the burden of the taxation. Similarly, higher commodity prices made possible by taxation of commodity exports outweighed welfare losses due to distortions in consumption and production.

[29] See Stiglitz (1988:46). It is likely, however, that cotton importers rather than cotton exporters would bear the brunt of such an export tax.
[30] The number rose from 18 in 1870-72 to about 50 in the 1890s, less than 140 before World War I and a little more than 50 in the early 1920s. Many firms owned more than one *salitrera*. See Sutter and Sunkel (1990).
[31] About 16,000 only in the state of São Paulo, Lalière (1909), p. 25.

Data Sources

Cotton

Price: Ellison (1968).

Import Tariff: free and dutiable, #U211 series, United States (1975).

Slave Price: Price of Prime Field Hand, Table 17, Conrad and Meyer (1958: 117).

Market: consumption, production and stocks from Ellison (1968).

Import Price: #E94 series from United States (1975), wholesale price index (Taylor) for Charleston S.C., Foreign Imports for 1826-43 and price index of British exports from Imlah (1958: 94-98) for 1843 and henceforth.

Sauer: Sauerbeck, A. (1904 and henceforth), *Prices of Commodities and the Precious Metals,* JRSS. In: Mitchell and Deane (1971).

Saltpetre

Price: world price of ton of saltpetre, Table 4.9, series (3), in Braun *et al.* (2000: 132)

Import Tariff: Diaz and Wagner (2004).

Export Tariff: Diaz and Wagner (2004).

Domestic Prices: consumer price index, Table 4.1, series (1), in Braun *et al.* (2000: 100)

Exchange Rate: nominal exchange rate, pesos chilenos against dollar (annual average), Table 4.1, series (4), in Braun *et al.* (2000: 118)

Sauer: Sauerbeck, A. (1904 and henceforth), *Prices of Commodities and the Precious Metals,* JRSS. In: Mitchell and Deane (1971).

Coffee

Price: Santos type 7 coffee, US cents per pound, calendar years, from Thurber (1881) for 1833-1880 and Bacha and Greenhill (1992) for 1881-1960.

Import Tariff: average import tariffs computed from Brasil (1941), Brasil (1990) and Fritsch (1988).

Export Tariff: *ad valorem* export tariff for Brazil was computed as the sum of Federal *ad valorem* tariff with São Paulo state *ad valorem* tariff. Exports data came from Brasil (1990) and *Annuario Estatístico de São Paulo* (several issues) while

exports rights came from *Mappas Estatísticos do Commercio e Navegação do Porto do Rio de Janeiro* (several issues), *Balanço, Receita e Despeza do Império* (several issues), *Receita e Despeza da República* (several issues), *Report of Her Majesty's Secretaries of Embassy and Legation* (1884), *Mensagens Presidenciais da Província de São Paulo* (several issues) and *Relatório da Fazenda do Estado de São Paulo* (several issues).

Market: consumption, production and stocks: Bacha and Greenhill (1992), Statistical Appendix.

Domestic Price Index: Catão (1992) from 1880 to 1913 and Haddad (1978) from 1914 to 1930.

Exchange Rate: Brasil (1941).

Sauer: Sauerbeck, A. (1904 and henceforth), *Prices of Commodities and the Precious Metals*, JRSS. In: Mitchell and Deane (1971).

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