American and Australian tariffs policies:

Do they rock or tango?

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Abstract:

This paper disentangles between two hypotheses on the determinants of Australia's and of the US' average tariffs levels. Relying on historical data that covers a century (1904 to 2005), the results indicate strong long-run relations between US and Australian tariffs, though the speed of adjustment to the long-run relationship is higher for the US. Inter-relations are also exhibited, with the US decisions influencing more strongly the Australian tariffs than the contrary.

Key-words: Australia, United States, Trade Policy, Tariffs

JEL Classification: C32, F13, F14, P16

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This paper presents an empirical analysis of the evolutions of trade policy (perceived through the average tariffs rate) between Australia and the United States. We cover both countries' trade policies for the last 100 years, and examine which links exist between each other. Intuitively, one can think of hypotheses when considering two countries trade policies: the first being that both policies are shaped uniquely by national considerations (what could be qualified as the "rock" hypothesis) and the second that there are reciprocal influences of one country over the other (or the "tango" hypothesis).

A confirmation of the first hypothesis could be considered as giving support to the literature on the political economy of trade, which insists on national factors (labor laws, level of wages, degrees of concentration in the industries threatened by imports …). The workhorse model in this literature is the study by Grossman and Helpman (1994), where trade policy is determined as the result of influence driven contributions. In the last few years research in this area has developed rapidly, both in terms of new theoretical developments and in empirical applications. The ‘protection for sale’ model is close to being the new paradigm in the literature on trade policy.

However, politicians' answers to the different lobbies aggregate at the national level and form the national trade policy. This national policy interacts with - and can be constrained by - external considerations or constraints (international trade agreements, for example). Such inter-relations between national trade policies would be analyzed under the "tango" hypothesis, the theoretical basis being then given by the literature on strategic trade policy (the seminal paper being here Brander and Spencer, 1985).

While Fung et al. (2009) theoretically show that the Grossman-Helpman policy can be identical to the Brander-Spencer benevolent dictator policy under some assumptions; concretely distinguishing the relative strength of the rock and tango hypotheses is an empirical matter that has not, to our knowledge, been attempted. Assessing the relative importance among both hypotheses is notably important for governance issues, e.g. assessing the degrees of freedom national politicians have in tailoring trade policy to their country's needs, but also to assess the prospects of free trade areas projects in the Pacific region, as they could be subject to external influences.

Our aim in this paper is thus to offer an empirical exploration of this issue. The papers' results show that the trends of both trade policies may not be the result of pure chance, but that a causal relationship exists. That the "tango" hypothesis stands out as the more relevant one matters per se, even more so as the American policy influences more the Australian than vice-versa.

The paper is structured as follows. The first section describes the data. It also details the several tests that are run to assess the relevance of the empirical methodology used in the

second section. This second section presents and discusses the result of the estimates. The last section concludes.

1. Data and statistical analysis

1.1. Data

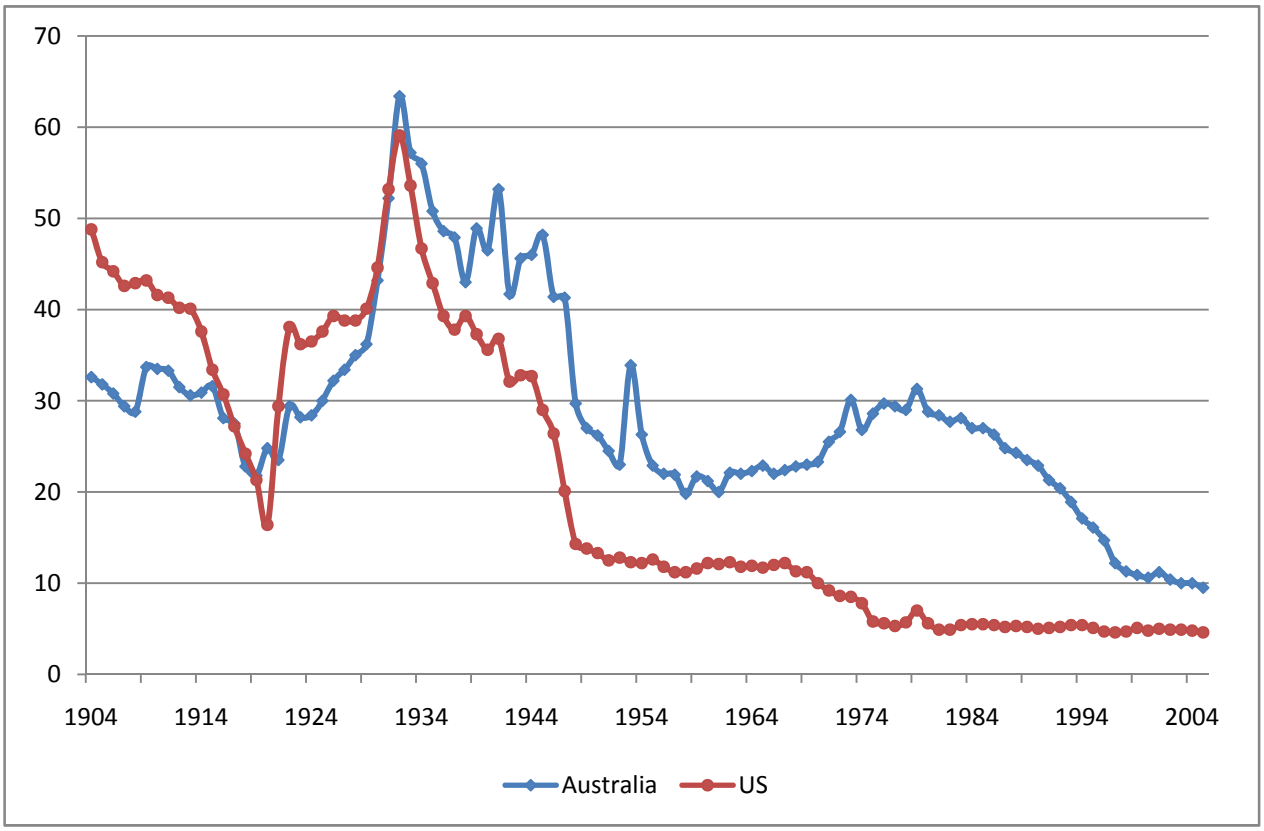
Our data set covers US and Australian's tariffs policies over the period 1904-2005, permitting to look at the long-term relationship, if any, between the two countries' trade policies. Interestingly, even though one of the two countries can be considered as much larger than the other, being the first world importer (while Australia is the 23rd) and the third exporter (Australia being the 25th)[1], the US can appear on several grounds as "a small country in world trade", to use the expression coined by Magee and Magee (2008).

The most important piece of data we make use of is the computations of both countries' tariffs for the last hundred years. We rely on Lloyd's (2008) estimates for Australia (*Austr*) and on the International Trade Commission (USITC, 2006) for the United States (*US*). These data are shown in figure 1. The two series we make use of are consistent and refer to the concept of Trade Restrictiveness Index (TRI) developed by Anderson and Neary (2005). The Trade Restrictiveness Index is the uniform tariff rate which yields the same utility as the differentiated structure of tariffs (and tariff equivalents if one can measure these for non-tariff measures). It is a welfare-based measure, which makes it all the more relevant. The TRI is an average of the nominal rates but it does take account of all inter-industry effects arising from the use of imported inputs that have been subject to tariffs.

1 2008 data from the CIA World Factbook (https://www.cia.gov/library/publications/the-world-factbook).

To take into account the possibility that domestic factors impact trade policies, we also introduce in the estimations national political variables (election years, political leadership of the House …[2]). In accordance with Irwin (1998), we include an import price index for both countries, to account for the influence of external factors. Finally, growth rate is introduced to take into account previous results on Australia's trade policy, and notably those established by Athukorala and Chand (2007), who have exhibited a stable and negative relationship between Australia's economic growth and tariff rates. Data summary statistics and precisions on the sources are provided in the Appendix.

Figure 1. Tariff rates – Australia and the United States (1904 – 2005)



[2] Political data are collected from the Office of the Clerk from the House of Representatives for the US (http://clerk.house.gov/art_history/house_history/partyDiv.html) and, for Australia, from http://australianpolitics.com/elections/results/ .

We include dummy variables *D* representing common trade agreements. Both Australia and the US ratified the General Agreement on Tariffs and Trade (GATT) in 1947 in Geneva, which came into force on 1st January, 1948. This means they have been subject to common influence due to this membership. Consequently we introduce common dummy variables for both countries. A first one is a dummy named *GATT,* for the period 1947-1992 and a second one (*WTO*) begins at the creation of the World Trade Organization in 1993 and lasts until the end of the sample. These trade agreements are expected to reduce tariffs in both countries. However, in the estimation of Australian tariffs, we have to introduce a dummy variable for 1952. As Lloyd (2008) states, "there was a sharp spike in the average duty on dutiable clearances in 1952-53. This movement is unusual in that it was not due to an increase in tariff rates. Rather there was a sharp rise in imports of dutiable goods in 1951-52 relative to free imports at the peak of the Korean War boom, followed by a sharp fall in these imports in the following year". The dummy thus takes into account this peculiar year.

For the analysis of the multivariate time series that include stochastic trends, several unit root tests are used for the estimation of individual time series, with the intention to provide evidence about when the variables are integrated, and also to check whether there is a structural break in trend and/or intercept. This is followed by multivariate cointegration analysis through the Engle-Granger methodology. All these tests' results are successively presented.

1.2. Unit root tests

First, we test whether each series has a unit root using several unit root tests. For the Augmented Dickey-Fuller (1979) unit-root test, tests in levels and then in first differences were carried out. Each series started with the most flexible specification of the test equation

that includes an intercept and a trend. The results, presented in table 1, suggest that the null hypothesis in the tariff time series cannot be rejected at a 5% level of significance in variable levels. Therefore, no tariff series appear to be stationary in variable levels. When the tariff series are transformed into their first differences, they become stationary and consequently the related variables can be characterized as being integrated of order one, I(1). However, all other variables are stationary. These results are confirmed by Phillips and Perron (1988) unit-root test and Kwiatkowski et al. (KPSS, 1992) test for stationarity.

Second, we test for the existence of a structural break. A weakness of the "Dickey–Fuller" style unit root test with I(1) as a null hypothesis is its potential confusion of structural breaks in the series as evidence of nonstationarity. Due to our long time dimension, we make use of a test developed by Zivot and Andrews (1992) that allows for a single structural break in the intercept and/or the trend of the series, as determined by a grid search over possible breakpoints[3].

Table 2: Results of Zivot and Andrews one-break test

Variables	**Number of lags**	**t-statistics**	**Integration order**
Australian tariffs	2	-3.856	I(1)
US tariffs	3	-4,169	I(1)
*The critical values for Zivot and Andrews test are -5.57,- -5.08 and -4.82 at 1 %, 5 % and 10% levels of significance respectively. *** denotes statistical significance at 1% level.*			

The results for Zivot and Andrews' unit root test are presented in table 2. These results suggest that we fail to reject the unit root hypothesis for the two series[4].

[3] The procedure conducts a Dickey–Fuller style unit root test conditional on the series inclusive of the estimated optimal breaks.

[4] Though Lloyd (2008) asserts the existence of a major break in the series in 1947-1948, due to a change in the method of valuation of imports in Australia and with the entry of USA and Australia in the GATT, the tests find no structural break in trend or intercept.

Table 1. Results of unit root tests without accounting for a structural break

		ADF test						**KPSS test**		**Phillips Perron test**				**Integration order**
Variables	**Country**	**Variables in levels Model with intercept and trend**				**Variables in first difference Model without intercept or trend.**		**Variables in levels**		**Variables in levels**				
		Lags	**Stat Z(t)**	**Intercept**	**Trend**	**Lags**	**Stat Z(t)**	**Lags**	**Test statistic**	**Stat Z(rho)**	**Stat S(tau)**	**intercept**	**trend**	
Tariffs	Australia	2	-2.24	3.69** (2,22)	-0.03* (-1,90)	1	-5.70***	2	0,444***	-7,89	-1,97	2,94* (1,82)	-0,02* (-1,69)	I(1)
	US	1	-2,66	3.45** (2,21)	-0.04** (-2,09)	1	-6,60***	1	0,339***	-3,28	-1,54	0,08 (0,18)	-	I(1)
Labor Prime Minister (Aust.) Democratic President (US)	Australia	1	-4.29***	0.10** (2.55)	-	1	-8,24***	1	0,167	-28,43***	-4,01***	0,08** (2,23)	-	I(0)
	US	1	-3.48***	0.11** (2.48)	-	1	-6,96***			-24.06***	-3.592***	0.09** (2,28)	-	I(0)
Election year	Australia	2	-7.07***	0.73*** (6.69)	-	1	-11,97***	2	0,066	-119,7***	-19,78***	0,55*** (9,68)	-	I(0)
	US	1	-13.93***	0.5*** (9.85)	-	1	-12,08***	1	0,008	-100,0***	-23,32***	0,33*** (7,04)	-	I(0)
GDP growth rate	Australia	1	-6,51***	2,10*** (5,04)	-	1	-9,818***	1	0,244	-32,22***	-1,45	-	-	I(0)
	US	1	-6,31***	2.42*** (3,60)	-	1	-9,783***	1	0,253	-57,88***	-3,29***	-	-	I(0)
Import price index growth rate	Australia	1	-5,40***	2,70** (2,55)	-	1	-12,18***	1	0,163	-61,84***	-6,55***	2,73*** (2,72)	-	I(0)
	US	1	-6,43***	2,82** (2,29)	-	1	-12,15***	1	0,126	-86,19***	-8,42***	2,78** (2,35)	-	I(0)

, ** and * denote significance at 10%, 5% and 1% respectively. KPSS test differs from those ADF and Philipps Perron "unit root" tests by having a null hypothesis of stationarity.*

2. Empirical specification

Since it has been determined that tariffs variables are integrated of order 1, cointegration tests need to be performed. We adopt the Engle-Granger methodology. First we estimate the long run equilibrium relationship between US and Australian tariffs introducing also stationary independent variables. If the series of the estimated residuals (*ecm*) of this long run equilibrium are found to be stationary, US and Australian tariffs are cointegrated and there exists a long-run equilibrium between them. Second, we estimate the two following error correction models:

$$\Delta US_t = \alpha_1 \Delta US_{t-1} + \beta_1 \Delta Austr_{t-1} + \eta_1 ecm_{t-1} + \mu_1 \Delta X_t + \rho_1 X_{t-1} + \sigma_1 D_t + \varepsilon_t$$

$$\Delta Austr_t = \alpha_2 \Delta Austr_{t-1} + \beta_2 \Delta US_{t-1} + \eta_2 ecm_{t-1} + \mu_2 \Delta X_t + \rho_2 X_{t-1} + \sigma_2 D_t + \epsilon_t$$

Each dependent variable is regressed on lags of itself and on lags of all the other dependent variables. As stated above, the model also includes several exogenous variables *X*, to assess the influence of domestic growth and politics on tariffs policies. We include both changes and lags of the independent variables *X* (GDP growth rate and import price index growth rate). Lagged variables represent the long run effect whereas changes in the variable explain the short run effect of these variables on tariffs.

The *ecm* term, obtained from first step regression, represents deviations from any long-run relationship between the I(1) variables and I(0) variables. The coefficient on the error correction term, η, gives the adjustment rate at which the gap between US and Australian tariffs is closed. If η is negative and significant, the model is an error correction model (ECM), the relationship between tariffs exists in the long-run and the error correction mechanism induces the tariffs adjustments to close the gap with respect to the long run

relationship between tariffs. One country's tariff could deviate from the long-run equilibrium relationship due to certain shocks in the short-run, but it eventually converges to the equilibrium in the absence of shocks in subsequent periods.

As US tariffs are a function of Australian ones and vice versa, we check if we have to estimate our two ECM equations as a system of simultaneous equations. The Hausman test for endogeneity is performed and rejects the use of simultaneous equations. The equations have been estimated for the full sample and the stability of the estimated function has been tested by using the cumulative sum of recursive residuals (CUSUM) test proposed by Brown *et al*. (1975). As the plot of CUSUM does not lie outside the area between the two critical lines, the parameters are said to be stable over the sample. Finally, we estimate independently our two ECM equations using least squares.

3. Results

Table 3 reveals interesting results. First, the coefficients associated with the error correction terms in both regression equations are significant and negative as expected. Thus, the results show that there is a strong long-run relationship between US and Australian tariffs. Furthermore, statistical significance of the error correction terms also imply that, when there are deviations from long-run equilibrium, short-run adjustments in the dependent variable will be made to re-establish the long-run equilibrium. We can note that the speed of the adjustment from the deviation in the long-run relationship is quite different between countries. The model converges more quickly to equilibrium in the US, with about 85 percent of discrepancy corrected in each period.

Second, long-run coefficients computed in the first step indicate that higher US tariffs leads to long-term rise in Australian ones and vice versa. However, the long run effect of US tariff on Australian ones is higher than the reciprocal case.

Concerning the short-run interactions between the two countries, results overall reveal that the US positively impacts the Australian tariffs policy and vice versa. Everything thus happens as if Australians were retaliating to American protection spurs by increasing their own tariffs[5]. Tariffs thus evolve more like tango dancers than rockers. Overall, then, comparing confidence intervals, results show a more important influence of the US trade policy on Australia than the inverse relationship.

The coefficients related to the control variables also deliver interesting results. First, Athukorala and Chand's (2007) result is confirmed, as Australia's growth rate is negatively related to tariffs in the long-run. Second, it also appears that there is some path dependence in US tariffs (as appears to the naked eye, see figure 1), as is confirmed by the influence of lagged tariffs variation on the variation of tariffs. Third, everything happens as if domestic political factors (i.e., here, the presence of a Labor leader and of a Labor-led House) play no role. There is no significant relation between the Democratic (resp. Labor) leadership and the tariffs variation. This result is a confirmation of Hoffman (2009), who reports that party affiliation is not significantly related to the promotion of free trade in the US. Finally, in the US, there is a negative impact of import price growth rate on tariffs both in the short run and in the long run.

[5] This result can also be taken as a confirmation of the well-known view of the world spiralling in always more protectionism during the 1930s.

Concerning Australia, our results confirm the importance of sharp spike in tariffs in 1952-53, as the dummy variable takes a high value and is highly significant. Finally, the GATT and WTO dummies are insignificant for the US, while only the latter is (poorly) significant for Australia. The fact that international rounds of negotiations do not impact the aggregate national trade policies confirms the role of national considerations in determining these policies. It can be read as a confirmation of Fung et al.'s (2009) theoretical result that a lobby-driven policy can deliver a national policy similar to the one defined by a benevolent politician acting strategically (à la Brander – Spencer).

4. Conclusion

In this paper, we have disentangled between two hypotheses on the determinants of Australia's and the US' average tariffs levels. Relying on historical data that covers a century (1904 to 2005), we show that the trends of both trade policies may not be the result of pure chance, but that a causal relationship exists. That the "tango" hypothesis appears to be more important than the "rock" one matters per se, as we show that the American policy influences more the Australian than vice-versa.

These results have a strong significance. Theoretically, they plead for the inclusion of features of the strategic trade policy literature in the models based on the political economy of trade policies (à la Grossman – Helpman). Concretely, our results show that designers, for example, of free trade areas projects in the Pacific area will have to acknowledge existing inter-relations. That we have been able to uncover such features from the comparison of two countries imply that an even more realistic view of the determinants of trade policies could be obtained, if comparable datasets could be obtained for more countries.

Table 3: Estimation results – Error-correction models

	Australia tariff variation	*US tariff variation*
Lagged Aust. tariffs variation	*-0.14* *(-1.10)*	*0.24**** *(4.00)*
Lagged US tariffs variation	*0.65**** *(5.47)*	*0.83**** *(4.71)*
Growth rate variation	*-0.004* *(-0.17)*	*-0.003* *(-0.22)*
Lagged.Growth rate	*-0.31**** *(-3.32)*	*0.06** *(1.81)*
Import price index growth rate variation	*0.002* *(0.07)*	*-0.10**** *(-6.28)*
Lagged Import price index growth rate	*0.006* *(0.16)*	*-0.05** *(-1.67)*
Labor (Democratic) leader AND/OR House domination	*-1.04* *(-1.58)*	*-0.05* *(-0.09)*
Election year	*-0.55* *(-1.01)*	*0.28* *(0.65)*
Error correction term	*-0.45**** *(-2.80)*	*-0.85**** *(-4.25)*
D53	*8.93**** *(3.29)*	*/*
GATT	*-0.74* *(-1.25)*	*0.33* *(0.74)*
WTO	*-1.54** *(-1.70)*	*0.26* *(0.43)*
Intercept	*2.05**** *(3.31)*	*-0.24* *(-0.53)*
Long run interaction coefficient	*0.16*** *(2.05)*	***0.09**** ***(2.55)***
ADF	***-4.95******	***-7.34******

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Appendix

Table A.1. : Summary statistics

			Data Source	Mean	Std Dev.	Min	Max
Tariffs	Australia	1904-2005	Lloyd, 2008	28.9	11.2	9.5	63.4
		1904-1946		37.5	10.5	21.8	63.4
		1947-2005		22.6	6.6	9.5	41.3
	US	1904-2005	USITC, 2006	20.9	15.9	4.6	59.1
		1904-1946		38.0	8.3	16.4	59.1
		1947-2005		8.4	3.7	4.6	20.1
GDP growth rate	Australia	1904-2005	Maddison, 2006	3.4	3.3	-9.5	11.5
	US	1904-2005	Maddison, 2006	3.3	5.8	-20.6	20
Import price index growth rate	Australia	1904-2005	'Reserve Bank of Australia Bulletin' (http://www.rba.gov.au/Statistics/Bulletin) and Australian Bureau of Statistics (http://www.abs.gov.au/)	4.4	9.9	-34.8	43.4
	US	1904-2005	U.S. Bureau of the Census (1975) and U.S. Bureau of Labor Statistics (2007)	3.3	11.4	-46.6	50