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Key-words: Australia, United States, Trade Policy, Tariffs
JEL Classification: C32, F13, F14, P16

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# Australian and American tariffs policies: Do they rock or tango?

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. We discriminate between two hypotheses: that both policies have been shaped uniquely by national considerations (the "rock" hypothesis) and that there have been influences of one country over the other (the "tango" hypothesis).

A confirmation of the first hypothesis would give 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 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, would the second hypothesis be verified, this would give a clue on the degree of constraint globalization imposes on national politicians, and promote the literature on strategic trade policy (the seminal paper being here Brander and Spencer, 1985).

Discriminating among both hypotheses is thus important for governance issues, e.g. assessing the degrees of freedom national politicians have in tailoring trade policy to their country's needs. In this paper, we 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 matters per se, but also to assess the prospects of free trade areas projects in the Pacific region, as our results show they will be subject to external influences.

Our results show that the two hypotheses stand for different sub-periods. The first period (1904 – 1946) is a rocking period, where the US can decide on their own policy, with Australia acting as a follower. The second sub-period (1947 – 2005) is contemporaneous of the global trend towards reduced tariffs, and we show that the two countries we consider are no outliers on this ground. However, we show that reciprocal interrelations are stronger than before, a result that supports the tango hypothesis.

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 to which we resort to in the second section. This second section presents and discusses the result of the estimates. The third section looks at impulse-response functions, and the last section concludes.

## 1. Data and statistical analysis

### 1.1. Data

Our data set covers US and Australian' 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 and on the International Trade Commission (USITC, 2006) for the United States. These data are shown in figure 1. The two series we make use are consistent and refer to the concept of the 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 we 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.

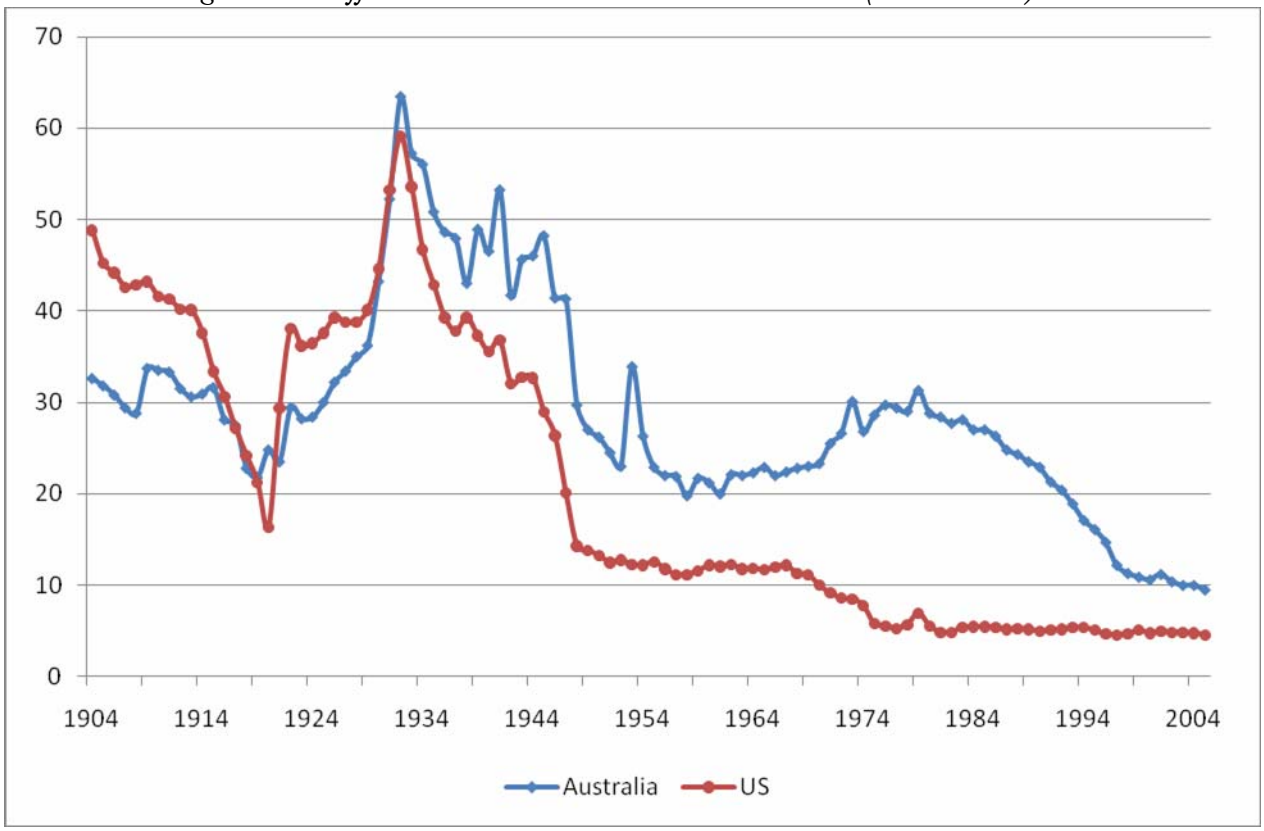
To take into account the possibility that domestic factors impact trade policies, we also introduce in the estimations national political variables (election years, political leadership of the House ...[2]). In accordance with Irwin (1998), we include an import price index for both countries, to account 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.

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. Especially, we make use of the Gregory and Hansen (1996) tests for cointegration that allow for the endogenous determination of the structural break in the cointegration vector. All these tests' results are successively presented.

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

[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 have been completed, for Australia, by http://australianpolitics.com/elections/results/ .

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




## 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 Perron (1988) unit-root test and Kwiatkowski, Phillips, Schmidt, and Shin (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].

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

*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) |
| *House leadership Labor (Aust.) Democratic (US)* | Australia | 1 | -4.29*** | 0.10** (2.55) | - | 1 | -8,20*** | 1 | 0,167 | -28,43*** | -4,01*** | 0,08** (2,23) | - | I(0) |
| | US | 1 | -3.24** | 0.13*** (2.68) | - | 1 | -8,94*** | | | -16.56*** | -2.99** | 0.11** (2,49) | - | 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 indexgrowth 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.*

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. There is no structural break in trend or intercept, although Lloyd (2008) asserts the existence of a major break in the series in 1947-1948. According to Lloyd, this major break is associated with the change in the method of valuation of imports in Australia and with the entry of USA and Australia in the GATT. As the series tend to confirm it (see figure 1), a logical final step, to determine the nature of the break defined by Lloyd (2008), is thus to perform ADF tests on the two subsets he identifies, i.e. before and after 1947. As we do not observe a structural break in the intercept or in the trend, we have to check if there is a difference in the stationarity of our main time series.

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

| **Variables** | **Number of lags** | **t-statistics** | **Break year** | **Integration order** |
|---|---|---|---|---|
| *Australian tariffs* | 2 | -3.856 | 1946 | I(1) |
| *US tariffs* | 3 | -4,169 | 1945 | 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.* | | | | |

*Table 3: Results of ADF test for sub-periods*

| **Sub period** | **Tariffs** | **Variables in level** | | | | **Variable in first difference Model without trend or intercept** | | **Integration order** |
|---|---|---|---|---|---|---|---|---|
| | | **Lags** | **Stat Z(t)** | **Intercept** | **Trend** | **Lags** | **Stat Z(t)** | |
| *1905-1946* | Australia | 2 | -1,68 | 4.32 (1,70)* | - | 1 | -3,35*** | I(1) |
| | US | 1 | -0,89 | - | - | 1 | -4,35*** | I(1) |
| *1947-2005* | Australia | 1 | -2,31** | - | - | 1 | -4,82*** | I(0) |
| | US | 1 | -7,42*** | 4.34*** (6.45) | - 0.06*** ( -5.42) | 1 | -3,55*** | I(0) |
| **, ** and *** denote significance at 10%, 5% and 1% respectively.* | | | | | | | | |

As can be read from table 3, ADF tests on our two subsets show that tariffs are non stationary over the period 1905-1946 but stationary over the following period.

### 1.3. Determination of the cointegration rank

Since it has been determined that tariffs variables are integrated of order 1, cointegration tests are performed. Although a number of cointegration tests now exist, Johansen's (1988, 1991) trace test has a number of desirable properties in our context, including the fact that

all test variables are treated as endogenous variables. The testing hypothesis is the null of non cointegration against the alternative that is the existence of cointegration using the maximum likelihood procedure.

Table 4 provides the results for the cointegration between our non stationary variables. The testing sequence (as provided by Lütkepohl, 1991) starts with the null hypothesis that the cointegration rank is zero. As this hypothesis cannot be rejected, then the testing sequence terminates and one can conclude that there is no cointegration relationship between US and Australian tariffs.

*Table 4: Johansen tests for cointegration*

| | **Maximum rank** | **Trace statistic** | **5% critical value** |
|---|---|---|---|
| *1905-2005* | 0 | 7,28* | 18,17 |
| | 1 | 2.6914 | 3.74 |
| *1905-1946* | 0 | 15.6911* | 18.17 |
| | 1 | 4.0393 | 3.74 |

Although the evidence from Johansen procedure does not support the presence of cointegration, there is some possibility that cointegration is detected when structural break is introduced. The Gregory-Hansen procedure is based on the use of three single equation models: a level shift model, a level shift model with trend and a regime shift model. Table 5 reports the Gregory and Hansen (1996) cointegration results for tariffs. ADF statistics are calculated for all possible break dates and the ADF* statistic reported in the table is the minimum value in these ADF series. As the null hypothesis of a lack of cointegration is never rejected, we can safely conclude that there is no cointegration between tariffs variables.

*Table 5: Gregory-Hansen cointegration tests for tariffs, full sample 1904-2005*

| | **Break date** | **ADF* -statistic** | **1% (5%) critical values** |
|---|---|---|---|
| Level shift | 1936 | -2,59 | -5,13 (-4,61) |
| Level shift with trend | 1990 | -2,78 | -5,45 (-4,99) |
| Regime shift (Constant and slope) | 1936 | -2,58 | -5,47 (-4,95) |
| *Critical values are computed using Gregory and Hansen (1996). *, ** and *** denote significance at 10%, 5% and 1% respectively.* | | | |

Studying the relationship between these series can be carried on through a VAR model. However, the goal of a VAR analysis is to determine the relationships among the variables, not to determine the parameter estimates (Sims, 1980). Consequently, in a first step, we will estimate the model using OLS over each of the sub-period the statistical analysis has

permitted to define. In a second step, as our aim is especially to capture the evolution and the interdependencies between our time series, we will use the VAR methodology to obtain impulse response functions.

## 2. Empirical evidence

We estimate the two following equations:

$\Delta Tariff_{i,t} = \alpha \Delta Tariff_{i,t} + \beta \Delta Tariff_{-i,t} + \mu\ Growth_{i,t-1} + \gamma Politics_{i,t} + \lambda\ Import\ price\ growth\ rate_{i,t-1}$
for the first sub-period 1904-1946, and :

$Tariff_{i,t} = \alpha\ Tariff_{i,t-1} + \beta\ Tariff_{-i,t-1} + \mu\ Growth_{i,t-1} + \gamma Politics_{i,t} + \lambda\ Import\ price\ growth\ rate_{i,t-1}$
for the second sub-period 1947-2005, where $i$ = US or Australia.

Each dependent variable is regressed on lags of itself and on lags of all the other dependent variables. The model also includes several exogenous variables, to assess the influence of domestic growth and politics on tariffs policies.

We estimate these autoregressive models using least squares. Lags of the independent variables (GDP growth rate and import price index growth rate) are introduced to prevent endogeneity issues. We test whether residuals are correlated with one another using Breusch-Godfrey test. As we find serial correlation, the usual least squares standard errors are not correct and we compute consistent standard errors using an estimator proposed by Newey and West. The model is then efficiently estimated with HAC (heteroskedasticity– and autocorrelation–consistent) standard errors.

### 2.1. The first sub period: 1904 - 1946

We include dummy variables representing different periods of tariffs legislation. These periods differ between our two countries, as figure 1 illustrates. For the US, following Irwin (1998), there are 5 dummy variables representing legislative changes in tariff rates[4] and one dummy variable representing rate reduction resulting from executive agreements with foreign countries[5]. Concerning Australia, we construct 5 dummy variables representing administrative changes in tariff rates[6] and 5 dummy variables related to historical and economic events[7].

[4] *Dingley*, the Republican Dingley Tariff (1897-1908) ; *Payne*, the Payne-Aldrich tariff (1909-1912) ; *Underwood*, the Underwood tariff (1913-1921) ; *Fordney*, the Fordney-Mc Cumber tariff (1922-1929) ; *Smoot*, the Smoot-Hawley tariff (1930-1935).

[5] *RTAA*, the Reciprocal Trade Agreements Acts of 1934, considered to be effective from 1936 until 1947.

[6] *CTAO2*, the initial Customs Tariff Act of 1902 (1904-1907), *Lyne*, the Lyne tariff (1908), *Greene*, the Greene Tariff (1921), *Pratten*, the Pratten tariff (1926) and *Scullin*, the Scullin emergency duties implemented during the Great depression period.

[7] *BPR*, signaling the introduction of the British preferential rates, *Postwar*, for the period after the First World War, *Deval*, for the period after the devaluation of the Australian pound in 1931, *Crisis* for the Great Depression era and *WW2*, to identify the Second World War.

Table 6 reveals interesting results. First, Athukorala and Chand's (2007) result is confirmed, Australia's growth rate being negatively related to tariffs. Second, it also appears that there is some path dependence (as appears to the naked eye, see figure 1), as is confirmed by the influence of lagged tariffs variation on the variation of tariffs, though the sign differs between countries.

Third, everything happens as if domestic political factors (i.e., here, the presence of a Labor leader and of a Labor-led House) have a role to play. And they show a negative relation between the Democratic (resp. Labor) leadership and the tariffs variation. More specifically, the role of Democratic leaders (both as President and in the House) is systematically negative on the tariffs variation. As, during this period, the Democratic Party both defended the interests of farmers and laborers and a internationalist view of the world (notably under Wilson Presidency), such a result simply reveals the potential conflicts between these. This result is all the more interesting as the Democrats have not been in power as often as the Republicans during this period. Everything happens thus as if, when in power, the Democrats were pushing their trade agenda even more strongly.

Moreover, one should not forget that domestic political factors are also accounted for by the impact of the dummies. And these dummies are as much the results of political battles as of the two countries' openness to the rest-of-the-world[8]. Interestingly, the signs of the two latter variables (leadership and trade dummies) are the same in the two countries, which can be interpreted as a sign of a common trade agenda in the two countries. However, the only significant trade dummies for Australia are the one covering the very beginning of the period, and the one signaling the devaluation of the Australian pound in 1931. For the other sub-periods, domestic factors and pressures have been more influential. For the US, the striking thing is that the only non significant trade dummies are the ones signaling the Underwood and the Smoot-Hawley periods. The result for the latter may seem surprising, though a look at figure 1 shows that the US tariffs were already on the rise, even before the adoption of the new tariffs.

This relative confinement finds a confirmation by the absence of an influence of Australia's tariffs on the US ones. Though one could argue that Australia may not be the most influent country for the US, especially in this period, (i) we take the absence of an influence as a confirmation of the fact and (ii) the involvement of the US administration in the termination of the Ottawa agreement is, on the contrary, a confirmation of the fact that the US were not spurning the impact of the Commonwealth on its trade.

[8] However, one has to be cautious when interpreting the dummies. Consider, for example, the *BPR* dummy: this dummy signals the implementation of the Ottawa agreement, under which the signatories (of which the United Kingdom and Australia) enforced lower levels of protection with regard to themselves rather than with regard to the rest of the world. Though strongly significant in a first regression (not shown for space reasons), it loses its significance when import prices are included, as do most of the dummies. This reveals the strong link between import prices and the average tariff measure, a feature highlighted by Irwin (1998) for the US case.

*Table 6. Estimations results for the first sub-period (1904 – 1946)*

| | **Australia tariffs variation** | **US tariffs variation** |
|---|---|---|
| *Lagged Aust. tariffs variation* | -0,96*** (-6,68) | -0,21 (-1,41) |
| *Lagged US tariffs variation* | 0,48*** (3,97) | 0,36** (2,67) |
| *Lagged.Growth rate* | -0,67*** (-2,95) | -0,001 (-0,02) |
| *Lagged Import price index growth rate* | -0,18*** (-2,87) | -0,14** (-2,16) |
| *Labor (Democratic) leader AND House domination* | -4,23*** (-2,82) | -7,75*** (-3,62) |
| *Labor (Democratic) leader OR House domination* | / | -4,36* (-1,76) |
| *Election year* | -0,63 (-0,68) | 1,18 (1,11) |
| *US tariffs dummies:* | | |
| *DINGLEY* | / | -8,08*** (-3,54) |
| *PAYNE* | / | -5,31** (-2,51) |
| *UNDERWOOD* | / | -1,96 (-1,63) |
| *FORDNEY* | / | -7,09*** (-3,00) |
| *SMOOT* | / | -2,53 (-1,68) |
| *RTAA* | / | (dropped) |
| *Australian tariff dummies:* | | |
| *CTA02* | -4,02** (-2,74) | / |
| *Lyne* | 0,15 (0,08) | / |
| *BPR* | 0,58 (0,29) | / |
| *Postwar* | -3,28 (-1,32) | / |
| *Greene* | -1,80 (-1,41) | / |
| *Pratten* | -1,38 (-0,92) | / |
| *Scullin* | -1,61 (-0,73) | / |
| *Deval* | -5,55*** (-3,34) | / |
| *WW2* | (dropped) | / |
| *Crisis* | 9,85** (2,75) | / |
| *Intercept* | 6,07*** (3,03) | 7,34*** (3,15) |
| | | |
| $R^2$ | 71,17 | 63,57 |

***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Concerning the interactions between the two countries, results overall reveal that, during this sub-period, the US positively impacts the Australian tariffs policy. More precisely, the variation of the US tariffs positively impacts the variation of the Australian ones. Everything thus happens as if Australians were retaliating to American protection spurs by increasing more rapidly their own tariffs[9]

Overall, then, inspection of this first sub-period shows a more important influence of the US trade policy on Australia than the inverse relationship. Moreover, it appears that the US protectionism only spurred retaliation from its partners, as the Australian case shows. Hence, everything being equal, our results would define the US as the leader of a

[9] 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.

Stackelberg game, but a leader not able to prevent reprisals from the followers[10]. The trade policies of the two countries thus appear to move together, but with one partner leading the dance. They rock more than tango.

## 2.2. The second sub period: 1947 - 2005

Over the second sub period, 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. However, in the estimation of Australian tariffs, one has 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. Our results in table 7 confirm its importance, as it takes a high value and is highly significant.

Concerning Australia, first, and comparing to the preceding results, the striking fact is now that the negative relation between growth and tariffs is no longer significant, nor is the influence of the import price index. Second, the domestic political factors are not significant either, be it election years or the Labor domination in the House (and by consequence the fact that the leader is also a member of Labor). These results do not completely accord with the official policy of the Australian Labor Party which promotes a platform in favor of free trade and against special interests' requests for protection (though the platform was not adopted before the 1970s). The irrelevance of domestic political factors coincides with results for the US, as these factors become non significant too in the second regression. This result is a confirmation of Irwin (1998), stating that the US have traveled the path from congressionally set tariffs rates to negotiated tariff rates, and of Hoffman (2009), who reports that party affiliation is not significantly related to the promotion of free trade in the US.

Even more interestingly for our point is the fact that the US protection level is now impacted by the Australian tariffs preceding variation. In this sub-period, the US can no longer be compared to the leader of a Stackelberg game, as the results point to a more equilibrated relation between the two countries. There is a bilateral relationship between Australian and American tariffs.

In sum, the reciprocal influence of the Australian and US tariffs no longer permits to know who leads the path. We thus conclude that, in the second sub-period, tariffs evolve more like tango dancers than rockers.

[10] Note that it is out of the scope of this paper to verify if the conditions of a formal Stackelberg game are met (i.e. that the US anticipate the reaction of Australia when deciding on the tariffs). Hence, we emphasize the "everything being equal" cautionary note.

*Table 7. Estimates for the second sub-period (1947 – 2005)*

| | **Tariffs Australia** | **Tariffs US** |
|---|---|---|
| *Lagged Aust. tariffs level* | 0,82*** (10,69) | -0,07*** (-11,97) |
| *Lagged US tariffs level* | -0,27 * (-1,95) | 0,58*** (40,63) |
| *Lagged.Growth rate* | -0,19 (-1,28) | -0,0002 (-0,17) |
| *Import price index growth rate* | 0,04 (1,20) | -0,03*** (-11,06) |
| *Labor (Democratic) leader AND House domination* | -0,09 (-0,12) | 0,10 (0,55) |
| *Labor (Democratic) leader OR House domination* | / | -0,29 (-1,56) |
| *Election year* | -0,87 (-1,59) | -0,10 (-1,10) |
| *D52* | 10,21*** (4,52) | |
| *Trend* | -0,08* (-1,78) | -0,08*** (-25,57) |
| *Intercept* | 12,53** (2,19) | 11,57*** (34,62) |
| | | |
| $R^2$ | 91,79 | 98,79 |

***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

## 3. Impulse Response Functions: comparing different time periods

As we are interested in the relationships between the two countries' tariffs and, as shown above, given that a Vector autoregressive model (VAR) is adapted, we estimate the relationship between US and Australian tariffs, with the following general form:

$$Tariff_{i;t} = f(Tariff_{i;t-k}\ ;\ Tariff_{-i;t-k}\ ;\ Growth_{i;t-1}\ ;\ Politics_{i;t}\ ;\ Import\ price\ growth\ rate_{i;t-1})$$

where $i$ = US or Australia.

Each dependent variable is regressed on lags of itself and on lags of the other dependent variable. As above, the model also includes several exogenous variables, to assess the influence of domestic growth and politics on trade policies.

Over the first sub-period, tariffs are integrated of order 1. There is an issue of whether the variables in a VAR need to be stationary. Sims (1980) recommend against differencing even if the variables contain a unit root because it throws away information concerning the co-movements in the data. As shown by Sims et al. (1990), estimating the VAR in level still yields consistent estimates. Finally, we decide to estimate the different VARs in levels for each sub period. (This estimation strategy in presence of integrated series is more and more widely used in the VAR literature, see e.g. Kim and Roubini, 2000, or Elbourne and de Haan, 2006). Since it is possible to estimate in level and not in first difference, the question arises to estimate the full sample. The equation has 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) and the CUSUM of square (CUSUMSQ) tests proposed by Brown *et al*. (1975). As the plot of CUSUM lies outside the area between the two critical lines after the late 1940s, the parameters are said to be unstable over the sample. Moreover, conditions on autocorrelation and normality of residuals are not met. The 1940s break can explain that conditions on residuals are not satisfied. So we estimate the relation over the two sub periods defined before.

As a preliminary step, the appropriate orders of lag must be determined. Since arbitrarily selected specifications of the VAR model may produce unreliable results, we use the SBIC (Schwarz's Bayesian Information Criterion) selection criteria in order to specify the autoregressive VAR models. This model selection criteria is shown to outperform other alternatives (Mills and Prasad, 1992). A lag length of one is the best choice and is consistent with the size of the sample. We include a constant and time dummies in order to take into account outliers years (like the 1929 crisis or the 1952 sharp spike in Australia).

Second, we check whether autocorrelation test, whiteness of residuals, normality of residuals (Jarque-Bera test) and eigenvalue stability conditions are met. Specification tests for the VAR models were conducted and are presented in table A.2 in appendix. The Jarque-Bera normality tests indicated that the null hypothesis proposing normality distribution errors could not be rejected. Concerning the LM statistic, the null hypothesis of no serial correlation is never rejected. Moreover, eigenvalue stability condition is always satisfied which means that all the eigenvalues lie inside the unit circle. The overall results for the goodness of fit (calculated by R2) indicate that the estimated regressions were correctly explained.

Finally we examine the estimated Impulse Response Functions (IRF) for tariffs disturbances. The IRF permits to characterize the dynamic structure of the model and to show how shocks to one country tariffs filter through the model to affect other country's tariffs and eventually feed back onto the original country itself. The IRF traces the response of the endogenous variables to such shocks.

The impulse response functions (IRF) are presented in figures 2 to 5. The first set of impulse response functions (figures 2 and 3) reflects responses of Australian and US tariffs to one standard deviation shock to Australian tariffs, while the second set (figures 4 and 5) present the responses to one standard deviation of US tariffs. We present results of a shock for each sub period. The gray lines around the IRFs represent the 95% confidence intervals. The unit of the vertical axis is percentage deviation from the situation without shock.

The pattern of responses is clearly different from one sub-period to another, for both countries. More precisely, the impulse responses to Australian tariffs shock in the first sub-period indicate an increase in US tariffs the year after the shock followed by a decrease the following years, hence a hump-shape profile. Interpreting these results keeping in mind the preceding ones (and noting that the OLS estimates deliver the same coefficients as the VAR ones), one can see that a positive shock on Australian tariffs in period $t$ leads to a non significant increase in US tariffs in $t+1$. As can be seen in figure 2, the first year impact on the US variable seems positive (but the confidence interval is very large) and then US tariffs

slowly return to the original trajectory. Concerning Australia, a positive shock leads to a negative tariffs variation the following year and, since the impact of the Australian shock is not significant on US tariffs, then there is no feed back effect of the shock to Australian tariffs.

The impact of the Australian shock is different in the second sub-period: in response to the positive shock in period *t* on Australian tariffs, US tariffs react significantly in *t+1* and slowly go back to the original trajectory. Australian tariffs decrease too afterwards (the coefficient associated with the lagged level is inferior to 1). In *t+2*, the decrease in US tariffs could lead to an increase in Australian tariffs but this effect is not strong enough to offset the Australian dynamics so Australian tariffs continue to decrease. However, in the US, the decrease in *t+1* after the Australian shock is followed by a smooth increase in *t+2* and after. This is the consequence of both the domestic dynamics and of the Australian feed back effect (as Australian tariffs decrease in *t+1*, US tariffs increase in *t+2*).

Figures 2 and 3 show that the Australian and US responses to Australian shocks expire after ten years, except for Australia in the second sub-period. Changes in all the variables approach zero as the effect of the shock dampens out. But it takes nearly 16 years after a shock on US tariffs. All in all, then, the evidence from the VAR model confirms the "rock then tango" results.

## 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 first record a break in the series in 1947.

Separating the data into two sub-periods (before and after the 1947 break), we distinguish a "rock" and a "tango" regimes. The first designates the period where one country (the US) has a stronger influence on the other, while the second indicates that, after 1947, strong inter-relations have to be taken into account.

These results have a strong significance. Theoretically, they tend to dismiss models of trade policy that would not consider external influences, i.e. reprisals from outside partners, even for the US. It means that models of the political economy of trade could gain in including features of the strategic trade policy. Empirically, not only our results show that designers of free trade areas projects in the Pacific area have to acknowledge existing inter-relations, but they also imply that the recent period shows strikingly different patterns of relationships than older ones, and that one has to be cautious when considering long-run trends. 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.

*Figure 2.*
*Reaction to Australian tariffs shock*
*(1904 – 1946)*

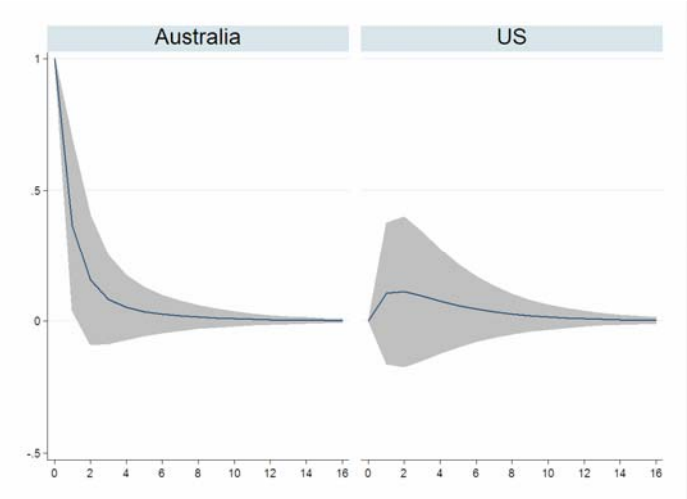



*Figure 3.*
*Reaction to Australian tariffs shock*
*(1947 – 2005)*

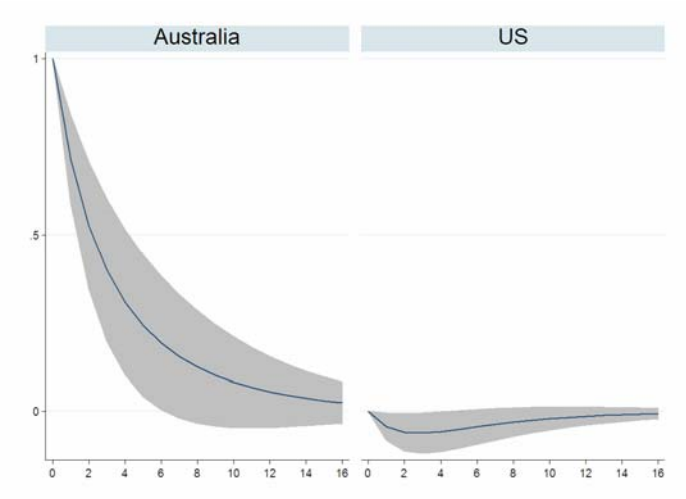



*Figure 4.*
*Reaction to US tariffs shock*
*(1904 – 1946)*

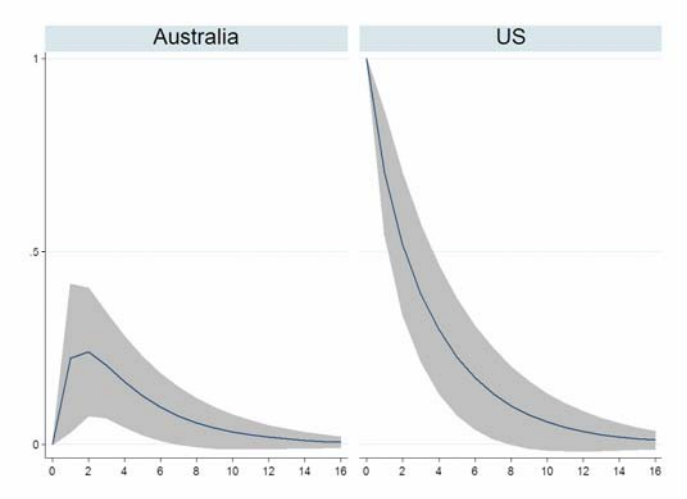
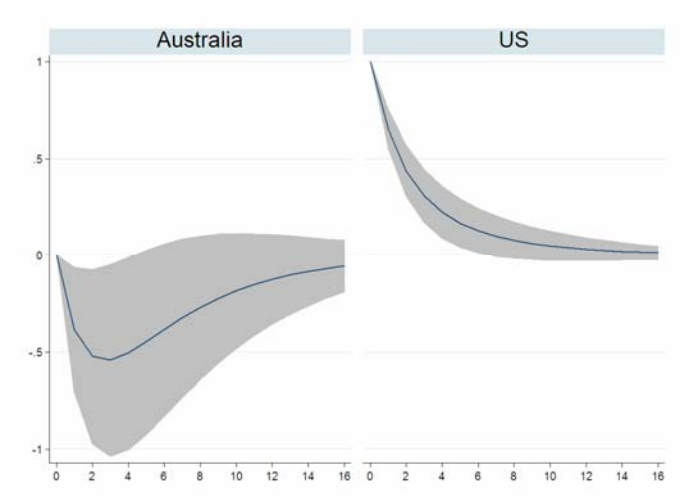



*Figure 5.*
*Reaction to US tariffs shock*
*(1947 – 2005)*



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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 |

*Table A.2.: Specification tests for the VAR models*

| | | **Before 1947** | **After 1947** |
|---|---|---|---|
| **Lag length** | | 1 | 1 |
| ***SBIC*** | | 11,45 | 6,66 |
| ***R2*** | **Tariffs Australia** | 95,24 | 95,77 |
| | **Tariffs US** | 94,62 | 98,73 |
| ***Residual Serial Correlation LM Tests*** | | 5,10 | 5,06 |
| ***Jarque-Bera (Chi-square)*** | **Tariffs Australia** | 1,38 | 2,06 |
| | **Tariffs US** | 0,95 | 0,49 |
| | **All** | 2,34 | 2,55 |
| ***Eigenvalue stability condition*** | | SATISFIED | SATISFIED |