NBER WORKING PAPER SERIES

THE IMPACT OF FEDERATION ON AUSTRALIA'S TRADE FLOWS

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Working Paper 12160
http://www.nber.org/papers/w12160

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
April 2006

This paper was written while the author was visiting the Faculty of Economics at the Australian National University. I thank Ian McLean, seminar participants at the University of Adelaide and ANU, and two referees for helpful comments on earlier versions of this paper. The views expressed herein are those of the author(s) and do not necessarily reflect the views of the National Bureau of Economic Research.

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April 2006
JEL No. F1, N7

ABSTRACT

In 1901, six Australian states joined together in political and economic union, creating an internal free trade area and adopting a common external tariff. This paper investigates the impact of federation on Australia's internal and international trade flows by studying changes in the "border effect" over this time. This is possible because Australian states reported intra-Australian trade prior to 1901 and for eight years after federation. The results indicate that federation itself produced little change in Australia's trade patterns, but that the border effect increased substantially between 1906 and 1909 when the protectionist Lyne Tariff was imposed.

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I. Introduction

In January 1901, the Australian colonies joined together in a political federation, setting the stage for the formation of a customs union later that year. As a result, all duties on intra-Australian trade were abolished and a common external tariff was imposed. The economic impact of this dramatic policy change is an important but unanswered question in Australian economic history.

The economic literature on customs unions suggest that a reduction in tariffs will create trade between partner countries and divert trade away from non-partner countries, with the effect on economic welfare being ambiguous.[1] Although the trade and welfare implications of a customs union can be evaluated with an applied general equilibrium model, the demanding data and parameter requirements of such models pose formidable obstacles to simulating such a policy change for early twentieth century Australia.

However, it is possible to examine changes in Australia's "border effect" for this period, i.e., the difference between its intra-national and international trade, as explored in a large literature started by McCallum (1995). A unique aspect of Australia's trade statistics during this period is that the Australian states collected data on trade with each other and with foreign countries prior to federation, and continued to do so for nine

[1] See Pomfret (1997) and Lloyd and MacLaren (2004) for recent surveys of the economic literature on regional trade arrangements and customs unions.

years after federation. These data give us a rare glimpse of how the country's internal and external trade flows changed as a result of political and economic union.

This paper studies how Australia's "border effect" changed in the years between 1890 and 1909. Section 2 describes the events leading up to the formation of the Australian customs union. Section 3 examines tariff barriers before and after federation and data on Australia's internal and external trade flows during this period. Section 4 presents the empirical results of a gravity equation model that permits the estimation of the effect of national borders on Australia's trade flows for selected years between 1890 and 1909. To anticipate the main findings, federation does not appear to have resulted in any discernable shift in Australia's aggregate trade flows. However, the measured border effect increased substantially between 1906 and 1909, which may be related to the imposition of the protectionist Lyne Tariff in 1907. Section 5 concludes the paper.

II. The Formation of the Australian Customs Union

The Australian states achieved a large measure of tariff autonomy in 1850 with the passage of the Australian Colonies Government Act by the British parliament. From the 1850s until Federation, each of the Australian colonies was an independent political entity that was entitled to determine its own import duties. While British colonial authorities had no role in setting the structure or height of these tariffs, they did require them to be non-discriminatory and uniform across all trading partners. As a result, the duties had to be applied to trade between the Australian colonies. The ban on

differential duties meant that the colonies could not give each other, or even Britain, preferential tariff treatment.

This ban on discrimination, in keeping with Britain's strong belief in universal free trade, had the unintended consequence of preventing closer economic ties between the Australian states. The imposition of tariffs on intra-Australian trade even became a source of strife and discontent. Conflict between New South Wales and Victoria over the customs treatment of border trade along the Murray and Darling rivers was particular source of difficulty, but was far from the only problem. Six intercolonial conferences in the decade after 1863 failed to improve matters and "at each the disagreement became more bitter," according to Reitsman (1960, p. 6). Indeed, in the words of one historian of early Australian tariff policy, "the history of the trade relations of the Australian colonies, it must be confessed, is a sorry record of intercolonial jealousy and strife" (Allin 1918, p. 1). "Provincialism" is a word often used to describe trade relations during this period.

The desire to eliminate these barriers to internal trade was a principal reason for the movement toward federation in the 1890s. As the first Australian Minister for Trade and Customs said in parliament in 1901: "Years and years we have struggled for Federation. Why? So that the fiscal barriers which have so long divided the sister States should be removed" (quoted in Reitsman 1960, p. 11). Of course, the negotiations leading up to the formation of the Commonwealth were difficult; New Zealand dropped out of the discussions,

and even the participation of Western Australia was in doubt.[2] Eventually, however, a constitution for the Australian Commonwealth was approved by voters after a second public referendum in June 1899. The United Kingdom agreed to the arrangement in July 1900, and on 1 January 1901, the six states of Australia united under the federal constitution.

Under the constitution, the six states lost their tariff autonomy and all power to regulate foreign commerce shifted to the federal government. Yet commerce between the Australia states did not become free of duty until a common external tariff had been settled upon. The framers of the constitution did not attempt to determine the tariff, but left this to be decided by the first Australian parliament. The constitution provided that "uniform duties of customs shall be imposed within two years after the establishment of the Commonwealth," but it did not take that long. The first common tariff was implemented on 8 October 1901. As of that date, all duties on commerce between the Australian states were abolished. A special constitutional provision permitted Western Australia to continue to impose duties on goods from other states for five years, with the duties declining by one fifth each year.

III. Federation and Australia's Trade Flows

At the time of federation, the Australian states were highly integrated economies, with few formal barriers to trade except the tariff. As Forster (1975) put it, "there were no barriers to the free flow of capital and labour, economic institutions often operated

[2] According to one historian of the period, "For the majority of New Zealanders, federation with Australia did not make economic or political sense in the face of the

across several colonies and of course there was very close resemblance in language, laws, and social institutions generally." Federation removed a principal barrier to exchange between the Australian states, namely tariffs. Over time, economic and political union also mitigated the influence of other policies that might have acted as non-tariff barriers between the states.[3] The combined impact of reduced tariffs and harmonized inter-state standards drew the economies of the Australian states even closer together.

The impact of the customs union formation in 1901 could be expected to vary by state, depending upon the height of its pre-federation tariffs. The tariff codes of each colony were similar in the 1850s, but increasingly diverged after the 1860s (Patterson 1968). New South Wales maintained a free trade policy, eschewing duties on imported manufactured goods and applying tariffs almost exclusively on "narcotics and stimulants" (tobacco and alcohol) for revenue purposes. Victoria adopted a more protectionist policy in levying higher duties on imports of manufactured goods to assist local industry. The other colonies chose to be somewhere in the middle of this spectrum, with Western Australia tending more toward the free-trade end and Tasmania imposing perhaps even higher barriers than Victoria.

However, it is difficult to assess the magnitude of these pre-federation barriers.

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expanding British market." Quoted in McLean (1995, p. 175).

[3] As Pincus (1995, p. 58) put it: "The new central government was given power over currency, coinage and legal tender; over banking, insurance, quarantine, corporations, bankruptcy, copyrights, weights and measures, posts and telegraph and the like; that is, over the ways in which the colonies had imposed non-tariff barriers on intercolonial trade." Other non-tariff barriers, such as different railway gauges, would take decades

Quantifying the impact of non-tariff barriers is inherently problematic, and even determining the height of pre- and post-federation tariffs is not a straightforward exercise. Table 1 presents some rough indicators on the average tariff barriers of the states prior to federation. The first column is the percent of imports that entered free of duty. The second and third columns measure the average tariff based on customs revenue as a share of total dutiable imports and dutiable imports excluding alcohol and tobacco. This last measure may be the best indicator of the average tariff imposed on goods that competed with domestic production because tariffs on alcohol and tobacco were often revenue duties which coexisted with domestic excise taxes. Even if these measures do not provide a perfect measure of trade barriers, they seem to provide a consistent rank ordering of the Australian states in terms of the restrictiveness of their trade regime.[4]

As the Table 1 indicates, New South Wales pursued a policy of low tariffs, with nearly 90 percent of imports entering duty free. After 1896, New South Wales imposed no tariffs on imported manufactured goods. The average tariff on dutiable goods of 10

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to eliminate.

[4] While the shortcomings of the tariff revenue as a percent of import value are well known, it may be the best available measure of trade policy. As Rodriguez and Rodrik (2001, p. 316) note, "It is common to assert . . . that simple trade-weighted tariff averages or nontariff coverage ratios - which we believe to be the most direct indicators of trade restrictions - are misleading indicators of the stance of trade policy. Yet we know of no papers that document the existence of serious biases in these direct indicators, much less establish that an alternative indicator performs better (in the relevant sense of calibrating the restrictiveness of trade regimes). An examination of simple averages of taxes on imports and exports and NTB coverage ratios leaves us with the impression that these measures in fact do a decent job of rank-ordering countries according to the restrictiveness of their trade regimes."

percent reflects the revenue raised from specific duties on "intoxicants and narcotics" – ale and beer, spirits and wine, opium and tobacco. (Domestic excise taxes were also levied on domestic production of tobacco and alcohol goods, so the tariff was essentially the international extension of those domestic excises.) Tariffs on other merchandise were only about one percent of import value. By contrast, Victoria imposed significant duties on imported manufactured goods and its tariff on merchandise other than narcotics and stimulants was nearly 20 percent. Tasmania allowed very few goods to enter the state free of duty, and average tariffs on merchandise exceeded 20 percent. Queensland, South Australia, and Western Australia had tariff rates somewhere in between the New South Wales and Victoria/Tasmania extremes.

However, the average tariff measures in Table 1 could be misleading indicators of the taxes applied to the goods that comprised most of intra-Australia trade. While Australia's overseas imports consisted largely of textiles and other manufactured goods from Britain, Australia's inter-state commerce consisted more of food, drink, metals, and agricultural products. The tariff codes for these products were a complex array of specific duties and domestic excises that make it extremely difficult to determine the differential impact of tariffs on intra- versus inter-national trade.

What about the level of the first common external tariff? Forster (1977) suggests that the political compromise reached by the states in parliament was not between free trade and existing protection, but between existing protection and further protection. In his view, the first federal tariff was substantially closer to Victoria's than to New South Wales's. Forster (1977) concludes that "for the colonies as a whole the tariff was raised

considerably." One reason for the increase in the average external tariff is that two levels of government now had to be funded – the states and the Commonwealth. A key part of the negotiation leading to federation concerned the division of customs revenues among the states. The transitional arrangement required the federal government to return to the states three-fourths of all customs and excise revenue for ten years after federation. Thus, the first parliament had a stake in raising a significant amount of tariff revenue because it only got to keep one quarter of the proceeds.

Figure 1 depicts the average Australia-wide tariff (as measured by total state customs revenue divided by Australia's total imports, similar to the state figures in Table 1) from 1890 to 1913. This figure might give some indication of the height of the first common external tariff relative to existing tariffs. From 1901 to 1903, the average tariff rose from about 20 percent to about 28 percent. Not all of this increase was due to the federal tariff, however, because the cyclicality of this measure is probably influenced by the interaction of import price movements and specific duties in the tariff code. That is, the increase in the average tariff after 1900 reflects in part the role of import price deflation in raising the ad valorem equivalent of specific duties, while the decline in the tariff from 1903 to 1906 reflects in part the impact of import price inflation in reducing the ad valorem equivalent of specific duties.[5]

[5] Australia's import price deflator declined 4 percent between 1901/02 and 1904/05, and increased 13 percent between 1904/05 and 1906/07 (Butlin 1977, p. 81). Because of specific duties, import price fluctuations also account for much of the change in the average U.S. tariff over time; see Irwin (1998).

The impact of Federation on the trade of the various states differs depending upon how the common external tariff compared to its initial tariff level. For example, New South Wales did not levy any significant tariffs on intra-Australian trade, except on drink and tobacco. Except for those goods, the customs union formation would not result in much trade creation with the other Australian states because New South Wales did not tax their goods prior to the union. However, New South Wales was required to increase its external tariff considerably as a result of federation, and its imports would probably be diverted from the rest of the world to the Australian states.

By contrast, Victoria did impose duties on imports from Australian states. If its tariff was not changed much by the new common external tariff, then Victoria could be expected to experience trade creation with the rest of Australia because it abolished all duties on goods from other states. The other Australian states with high initial tariffs also may have been in the position of enforcing a similar external tariff but abolishing duties on internal trade. Western Australia's trade might not be affected by Federation much at all since it continued to impose duties on intra-Australian trade until 1907 (albeit duties that were phased out over that time).

Figure 2 presents one depiction of how intra- and inter-national trade changed over the period 1893 to 1909. This measure of intra-Australian imports as a share of total imports for each state shows a slight decline for most states after 1895 until federation. This decline may be related to the economic recovery from the severe depression in 1893-95. As incomes recovered, foreign trade expanded at a more rapid rate than domestic trade (Boehm 1971, pp. 28ff). Political and economic union appears

to be weakly associated with a reversal in this decline, but there is not a sharp change in the shares that might be readily identifiable with federation. Tasmania experiences a slight rise in the share of intra-Australian imports after federation, but contrary to what might have been expected, there is not much increase in the share of Victoria's imports coming from other Australian states.

While it is tempting to identify the impact of federation on trade by comparing Australia's actual trade before and after 1901 (as in Figure 2), such an ex post interpretation is problematic because post-federation trade flows may be affected by a host of factors other than federation itself. A decline in external trade relative to domestic trade after federation might be mistakenly attributed to trade diversion as a result of the customs union when in fact it might simply be due to the sensitivity of foreign trade to income. Specifically, a major drought in 1902-03 resulted in a decline in real incomes right after federation that particularly affected the trade of New South Wales. Unfortunately, this problem virtually rules out any direct comparison of trade flows in 1900 with trade flows in 1902 as a way of measuring the impact of federation.

Given the problems of a simple ex post evaluation of trade flows, and the difficulties of constructing an applied general equilibrium model of the Australian economy at this time, this paper takes an indirect approach in trying to assess the impact of federation on Australia's trade. The indirect approach is to estimate the impact of Australia's political "border" on its trade by looking at the difference between Australia's intranational and international trade around the time of federation.

IV. A Gravity Model of Australia's Trade Flows

In an influential article, McCallum (1995) exploits a unique set of data on intra-provincial trade in Canada to compare the country's intra- and inter-national trade. McCallum uses the popular gravity model of bilateral trade flows, which relates a country's trade to its economic size and distance from trading partners, to provide an estimate of the implicit obstacles to trade created by national borders. McCallum estimates the following equation:

(1) $\log (X_{it} + X_{jt}) = \alpha + \beta_1 \log (y_i) + \beta_2 \log (y_j) + \beta_3 \log (DIS_{ij}) + \gamma D_{ij} + \epsilon_{ij}$

where X_{ij} is exports from region i to region j, y_i and y_j are the economic size (measured by GDP) of regions i and j, DIS_{ij} is the distance between regions i and j, and D_{ij} is a dummy variable that takes the value of one if regions i and j belong to the same country (i.e., an indicator of intra-national trade). In this equation, bilateral trade is expressed as a simple log-linear function of two countries' or states' GDP, the distance between then, and a dummy variable for intra-Canadian trade.

Using data from 1988, McCallum finds that the coefficient on the dummy variable was 3.1. Taking the exponential of this estimate yields the result that trade between Canadian provinces was 22 times greater than trade between the provinces and the United States, after controlling for distance and incomes. This finding stimulated a great deal of research on why there was so much intranational and so little international trade between the countries even though formal barriers to international trade were very low. (Subsequent work by John Helliwell and others find that the border effect was

only slightly diminished as a result of the U.S.-Canada Free Trade Agreement that took effect in 1989.)

As Feenstra (2002, 2004) and Anderson and van Wincoop (2003) point out, however, this is an upwardly-biased indicator of the magnitude of the border effect. Because of asymmetries created by differences in country size, there is not one exclusive measure of the border effect. For example, a given border effect will be large when measured from the standpoint of a small country, but small when measured from the standpoint of a large country.

Anderson and van Wincoop (2003) develop a specification to estimate border effects that accounts for this difference and is more closely tied to economic theory. The appropriate specification (constraining the coefficients on GDP to equal one) is:

(2) $\log (X_{ij}/y_i y_j) = \rho(1 - \sigma) \log (DIS_{ij}) + (1 - \sigma) \tau_{ij} + \log (P_i)^{\sigma - 1} + \log (P_j)^{\sigma - 1} + (1 - \sigma) \epsilon_{ij}$,

where σ is the elasticity of substitution in consumption between all goods, τ is the trade cost or implicit tax barrier to trade between countries, and the P's are price indicies ("multilateral resistance terms") that reflect, among other things, transport costs. Because the P's are not readily calculated, country fixed-effects have been proposed as an alternative estimation strategy that leads to consistent (but less efficient) results. To reduce the upward bias in the measure of the border effect, the dummy variable is switched to indicate international trade and not intranational trade. As a result, their estimating equation is:

(3) $\log (X_{ij}/y_i y_j) = \alpha \log (DIS_{ij}) + \gamma (1 - D_{ij}) + \beta_1 \delta_i + \beta_2 \delta_j + (1 - \sigma) \epsilon_{ij}$

where the δ's are indicator variables for state i and region j.

The results from the Anderson and van Wincoop specification in equation (3) cannot be directly compared to those from the McCallum specification in equation (1). However, the two can be compared if the McCallum regression is recast by constraining the coefficients on GDP to equal one such that:

(4) $\log (X_{ij}/y_i y_j) = \alpha \log (DIS_{ij}) + \gamma (D_{ij}) + \epsilon_{ij}$.

This equation will be estimated along with equation (3) simply for purposes of comparing the results from the two approaches.

Sufficient data exist from the federation period for these equations to be estimated for Australia. The intra-Australian trade and external trade data are from the annual statistical abstracts of the Australian states: New South Wales, Victoria, South Australia, Queensland, Western Australia, and Tasmania.[6] These unique data, which give us a rare glimpse at a country's internal trade pattern, were no longer published after 1909.

A recurring question about these data is the extent to which they are compromised by goods in transit between these states but ultimately destined for other countries. Both New South Wales (Sydney) and Victoria (Melbourne) received goods from other states in Australia that were to be shipped to the United Kingdom or other overseas destinations. Fortunately, the export data for New South Wales, Victoria, and South Australia explicitly separate out locally produced goods from those of other Australian state whose goods were in transit to other destinations. In addition, Tasmania

[6] That is, the annual Statistical Register for New South Wales, Western Australia, and South Australia, and the annual Statistics volumes for Victoria, Queensland, and

presented data both on exports and exports by country of final destination (e.g., exports to NSW are large, but many were ultimately going to the United Kingdom). The main concern is for data from Queensland and Western Australia, as sources for these states do not clearly break out transshipments. However, exports from these states can be matched with imports from New South Wales and Victoria, and it appears that Queensland and Western Australia did separate out transshipments in their reported trade with other Australian states.

Indeed, transshipment and reexports appear to be less of a problem with the trade data of the individual states than for the aggregate trade data applied by the Commonwealth Statisticians starting in 1901. As Boehm (1965, pp. 236-237) notes: "the understatements apparently apply only to the estimates of overseas exports and imports. It appears not to apply to the series of imports and exports of each colony which include both overseas and intercolonial trade and which are particularly useful for regional analysis."[7]

A related problem is unrecorded transactions between New South Wales and Victoria across the Murray river. Some assessments in the statistical publications of both states suggest that most trade between them was moved by ship or by rail, implying

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Tasmania.

[7] Even so, Boehm shows that transshipments were only about 2 percent of recorded merchandise exports for Australia in the 1890s. See also Boehm (1971), appendix 1.

that the magnitude of unrecorded trade was not substantial. But there is no simple method to account for the fact that some river transactions went unrecorded.[8]

The sources for the other data are straightforward. Measures of real GDP are taken from Maddison (2003). Maddison presents data for 20 countries with which some of the larger Australian states traded: New Zealand, United Kingdom, Canada, India, Ceylon (Sri Lanka), Argentina, Brazil, Chile, Belgium, Holland (the Netherlands), France, Germany, Italy, Sweden, China, Japan, Java (Indonesia), Mexico, Peru, and the United States. For Australia, real GDP is also taken from Maddison (2003) and apportioned to the various states based on the GDP shares in Cashin (1995). Distance is sea shipping distance from http://www.distances.com.

Equations (4) - the variant on the McCallum regression - and equation (3) - the Anderson and van Wincoop specification - are estimated for the years 1890, 1900, 1906, and 1909. This gives us a picture of Australia's trade well prior to federation, just prior to federation, and for two separate years after federation. The year 1890 is about as far back in time that sufficient observations are available to make for informative results. Even so, in this year there are no observations for Western Australia's or Tasmania's exports as neither state reported their trade statistics in sufficient detail. The year 1900 is just prior to federation and includes observations from all states. Ideally, one would like to examine the year 1902 as the year after federation to compare it with 1900, but

[8] In results that are not reported, a dummy variable indicating trade between New South Wales and Victoria was used to see if trade between the two states was smaller than might have been expected given the economic size and distance between them. Invariably, the dummy variable was small with a large standard error.

the best comparison years (1902-04) are affected by drought. By 1906 the Australian economy had recovered and so that year is taken as the best representation of Australia's trade after federation. The year 1909, the final year in which intra-Australian trade data were published, captures the impact of the Australian tariff imposed in 1907.

Table 2 presents the results. For each year, the first column reports results from our variant of McCallum's specification (equation 4) and the second column reports results from Anderson and van Wincoop's specification (equation 3). Given the importance of the British Commonwealth to Australia's trade patterns, a dummy variable for trade with another Commonwealth country is also included in the regressions. For 1890, the first column reports that the coefficient on the intra-Australian trade dummy variable is 3.16. Taking the exponential of this estimate suggests that intra-Australian trade is 23 times greater than trade between Australia and the rest of the world. (This result is remarkably close to McCallum's estimate of intra-Canadian trade in 1988.) In addition, taking the exponential of the coefficient on the Commonwealth indicator suggests that trade within the British Empire was 7 times greater than trade with the rest of the world. As is commonly noted, these are exceptionally high figures.

The second column for 1890 includes indicator variables for the exporting state and for four importing regions (Oceania, Asia, Europe, and the Americas) and reverses the dummy variable so that it represents international trade. How should we interpret the estimate of gamma as -1.55, representing international trade? As Feenstra (2002, 2004) notes, in moving from equation (2) to equation (3), $(1-\sigma)\tau_{ij}$ was replaced by (1-

D_{ij}), so equating these two and solving for the exponential of $\exp(\tau_{ij})$ yields $\exp[\gamma(1-D_{ij})/(1-\sigma)]$. For cross-border trade ($D_{ij} = 0$), $\exp(\tau_{ij}) = \exp[\gamma/(1-\sigma)]$, and thus the impact depends upon the elasticity of substitution. If we take $\sigma = 5$, then the estimate of $\exp(\tau_{ij}) = 1.47$. This suggests that the implicit border barrier between Australia and the rest of the world amounts to an implied tax of 47 percent.

However, this implicit price barrier is highly sensitive to the assumed elasticity of substitution. With $\sigma = 4$, for example, the implicit tax rises to 68 percent, and if $\sigma = 3$, then the tax is about 117 percent. We lack any solid information on the elasticity of substitution between domestic and foreign goods for this period; it could be that Australian products were quite different from foreign (imported) goods, making for a low elasticity of substitution and a higher implicit tax.

We cannot use the estimate of (to determine how much more trade there was within Australia than across the border, but its exponential is equal to the geometric mean of the border's impact on intranational trade relative to international trade for each country, i.e., the average border effect for Australia and rest of the world (Feenstra 2002, 2004). In this case, since $e^{1.55} = 4.7$, the average effect of the border is to raise intranational by a factor of 4.7 above international trade. This clearly indicates that there was a significant border effect prior to federation.

The results for 1900 are more noteworthy than those for 1890 because they includes the trade of all six states, resulting in many more observations. The results indicate a decline in size of the intra-Australian trade variable, suggesting that the degree of intra-state trade fell from 23 in 1890 to 16 in 1900. Similarly, the magnitude

of the Commonwealth dummy variable falls as well. Despite this, the implicit tax arising from the fixed-effect estimation indicates a slight decline to 41 percent (again assuming $\sigma = 5$). The average border affect is little changed from 1890.

The real question is how federation changed this border effect. The final four columns for Table 2 report similar regressions for 1906 and 1909, the last year in which the Australian states reported data on intra-Australian trade. While intra-Australian trade exceeded external trade by a factor of 16 in 1900, it exceeds it by a factor of 22 in 1906. One would expect such an increase with the formation of a customs union. The intra-Commonwealth indicator variable continues to decline relative to 1890 and 1900. However, in the Anderson and van Wincoop specification, the implicit border tax and average border effect are slightly smaller in 1906 than in 1900. The implicit border tax is 41 percent in 1900 and 40 percent in 1906, while the average border effect falls from a factor of 4.7 to 3.9. Given the similarity in the results for these two years, it appears that federation did not have a substantial impact on the "border" between 1900 and 1906.

What explains the fact that internal free trade as a result of federation apparently brought about no significant changes in Australia's trade flows? One possibility is that tariff barriers were not a serious impediment to intra-Australian trade, while non-tariff barriers (such as different railway gauges) were not immediately affected by federation. Another possibility is that the high degree of capital and labor mobility between Australian states in certain industries effectively overcame any significant trade barriers and these factor flows substituted for trade flows even after the internal tariff was

reduced (Mundell 1957). Unfortunately, the results here cannot shed light on the precise reasons why federation did not significantly alter Australia's trade pattern.

However, the results for 1909 are strikingly different from the previous years. In the McCallum specification, intra-Australian trade is now 40 times greater than external trade. In the Anderson and van Wincoop specification, the implicit border tax rises from about 40 percent to more than 70 percent, and the average border effect more than doubles, increasing from 3.9 in 1906 to 8.9 in 1909.

The key policy change between 1906 and 1909 was the imposition of the Lyne tariff of 1907. By all accounts, the Lyne tariff substantially increased tariff rates. Shann (1930) reports that it roughly doubled duties and reduced the number of commodities on the duty-free list. According to a League of Nations study, the average Australian tariff on manufactured goods rose from 6 percent in 1902 to 16 percent in 1913 (Anderson and Garnaut 1987, p. 7). The year 1908 stands out as one in which the average tariff jumped noticeably, according to Figure 1. Thus, it appears that a much greater degree of trade protection was adopted not as a result of federation, but as a result of legislation adopted shortly thereafter.[9]

The other significant change in the 1907 tariff was the introduction of tariff preferences for the British Commonwealth. These preferences appear to have the slight effect of halting the decline in intra-Commonwealth trade that was evident up to this point. These effects are all summarized in Table 3, which shows how different the year

9 See Sullivan (1997) for a detailed study of Australia's tariff politics in the first decade of federation.

1909 is compared to the other years. These results suggest that the import tariffs imposed by Australia after federation altered its external trade to a much more significant degree than the act of federation itself. Yet the difference in the border indicators between 1906 and 1909 is not statistically significant. When the data from those two years is pooled with a year dummy and interactions with the year dummy, the coefficient on the border effect interacted with the year dummy (for 1909) is -0.45 with a standard error of 1.11. Thus, one cannot reject the hypothesis that the border effects are the same in both years due to the imprecision with which those effects are measured.

V. Conclusions

In 1901, six Australian states formed a customs union with political federation. Although the removal of tariff barriers to intra-Australian trade might be expected to significantly alter the balance between the country's internal and external trade, the share of intra-Australian imports rose only slightly after federation. A gravity equation model suggests that there was not a significant shift in Australia's trade in 1906 compared to 1900.

However, the Lyne Tariff of 1907/08 significantly increased Australia's external tariffs and the gravity equation estimates of the "border effect" rise sharply between 1906 and 1909. This suggests that Australia's growing economic distance from the world into the mid-twentieth century was much more the result of its own external tariff policies than to trade diversion resulting from its formation of a free trade area in 1901.

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Table 1: Estimates of Average Import Duties in 1900

	Percentage of Imports on Duty Free List	Average ad valorem Rate of Duty	
		On Dutiable Merchandise Imports	On all Merchandise other than Narcotics and Stimulants
New South Wales	87.6	10.3	1.3
Victoria	53.4	36.2	17.0
Queensland	36.0	20.5	13.1
South Australia	35.7	21.8	14.0
Western Australia	37.1	14.8	9.3
Tasmania	9.0	24.2	22.0

Source: Coghlan (1904), p. 284.

Table 2: Estimates of Border Effects for Australia

	1890		1900		1906		1909	
Distance	-0.29 (0.47)	-0.84* (0.51)	-0.60* (0.33)	-1.20* (0.55)	-0.55 (0.41)	-0.70 (0.55)	-0.31 (0.38)	-1.14* (0.60)
Indicator - Australian Trade	3.16* (0.96)	--	2.75* (0.75)	--	3.10* (0.84)	--	3.68* (0.87)	--
Indicator - Commonwealth Trade	1.91* (0.84)	--	1.67* (0.57)	--	1.36* (0.61)	--	1.40* (0.56)	--
Indicator - Border	--	-1.55* (0.59)	--	-1.55* (0.64)	--	-1.35* (0.73)	--	-2.19* (0.98)
Indicator – Non-Commonwealth	--	-2.04* (0.93)		-1.87* (0.56)	--	-1.27* (0.70)	--	-1.70* (0.55)
R^2	0.56	0.70	0.54	0.62	0.54	0.61	0.56	0.64
Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	66	66	118	118	113	113	117	117

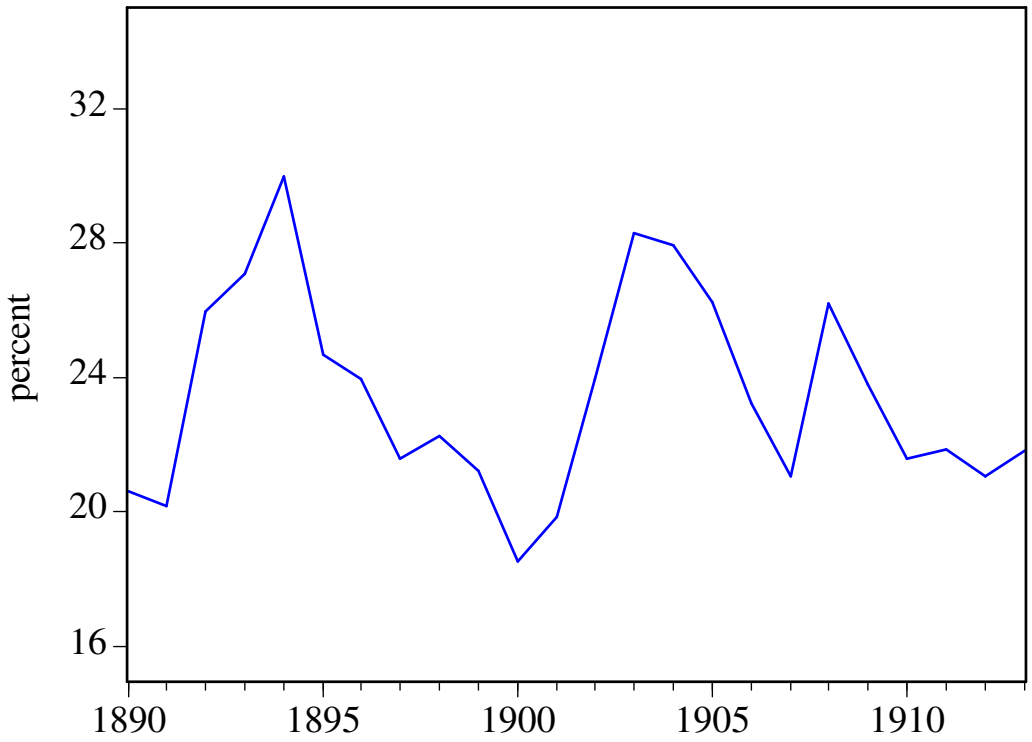
Note: For each year, the first column is the McCallum specification (equation 4) and the second column is the Anderson and van Wincoop specification (equation 3). Robust standard errors reported in parenthesis. * indicates statistical significance at the 5 percent level.

Table 3: Summary of Results

	Based on McCallum specification		Based on Anderson and van Wincoop specification	
	Intra-Australian Trade	Intra-Commonwealth Trade	Implicit Border Tax ($\sigma = 5$)	Average Border Effect
1890	23	7	47%	4.7
1900	16	5	41%	4.7
1906	22	4	40%	3.9
1909	40	4	73%	8.9

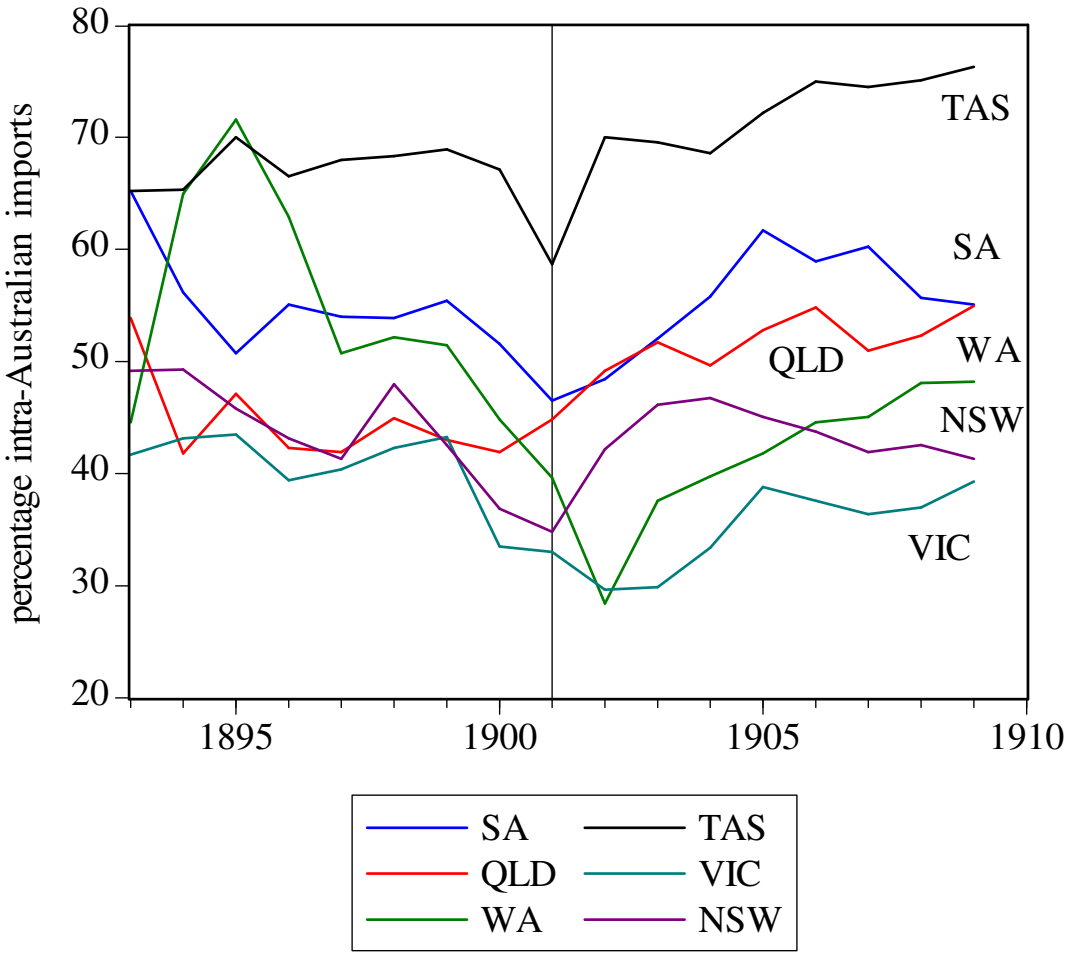
Note: See text and results from Table 2.

Figure 1: Tariff Revenue as a percent of Total Imports, Australia 1890-1913



Source: Vamplew (1987), series GF357, ITFC 23, ITFC 152.

Figure 2: Share of Australian Imports in Total Imports, by State, 1893-1909



Source: Yearbook of the Commonwealth of Australia, early issues.