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Veröffentlichungsversion / Published Version

Zeitschriftenartikel / journal article

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#### Empfohlene Zitierung / Suggested Citation:

Zanella, F. (2008). The spend-and-tax or tax-and-spend: further evidence for the Brazilian imperial period. *Historical Social Research*, 33(4), 255-263. <https://doi.org/10.12759/hsr.33.2008.4.255-263>

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# The Spend-and-Tax or Tax-and-Spend: Further Evidence for the Brazilian Imperial Period

*Fernando Zanella*\*

**Abstract:** »(Steuer) einnehmen und ausgeben oder ausgeben und (Steuer) einnehmen: Weitere Einsichten zur imperialen Periode in Brasilien«. This article tests the flows of rents during the Brazilian Imperial period. To achieve this goal, a Vector of Error Correction Model (VECM) was employed to test long-run and short-run relationships between government revenues and expenditures. The VECM was applied for the entire imperial period with data available (1836-1889) and for the period after the Law *Alves Branco* (1844-1889), which more than doubled tariffs on imports. A trivariate causality test fails to show a casual relationship among the variables in any direction, regardless of the period tested. When the augmented granger causality test is employed for the entire period, results show a unidirectional causality from government expenditures to revenues, a spend-to-tax model, and a bi-causality relationship for the 1844-1889 period.

**Keywords:** VECM; Imperial Brazil; Spend-and-Tax.

## I. Introduction

Economic historians do not have the same amount and quality of information to conduct an investigation that a researcher has when dealing with recent events. Data is specially limited; therefore, studies are heavily based upon anecdotal evidence. Some quantitative evidence on the role played by different groups within a particular country may be obtained by examining the government budget. Due to lack of proper accountability, the government's budget was once somewhat of a "black box". Nevertheless, it is possible to inspect the "black-box" flow of rents. Eventually, it is feasible to determine the amount and speed of the inflows (government revenues) and of the outflows (government expenditures). Such crucial information allows the researcher to go a step further, i.e., to investigate its dynamic and connect it with the roles played by different groups—in particular, the rent-seekers. That is precisely the objective of this paper.

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The author would like to thank, without implicating, Manuchehr Irandoust, Aktham Al-Maghyreh and Haitham Al Zoubi for helpful comments.

This paper's goal is to test the flows of rents during the Brazilian Imperial period (1822-1889). To achieve this goal, a Vector of Error Correction Model (VECM) was employed to test long-run and short-run relationships between government revenues and expenditures. In particular, we test the spend-to-tax (Peacock & Wiseman, 1979) or tax-to-spend (Friedman, 1978) models, as previously tested in the literature in several cases (for instance, Chang et. al, 2002), including the Brazilian case (Mello, 2007). Nevertheless, such models were applied just once for the Brazilian Imperial period (Zanella, 2007) using a simple Granger bi-causality test.

More precisely, this article tests the following hypotheses:

- 1) *Government revenues determine government expenditures.* This is the tax-to-spend hypothesis.
- 2) *Government expenditures determine government revenues.* This is the spend-to-tax hypothesis.
- 3) *Previous government revenues determine expenditures, and government expenditures determine revenues.* This is the hypothesis of bicausality or interdependence between revenues and expenditures.
- 4) *There is no significant statistical relationship between government revenues and expenditures.* This hypothesis suggests either independence or an undetermined statistical relationship between the variables.

All the above four hypotheses will be tested in two ways. The first is the tri-variate causality, in which immigration was added as an additional variable; the second is the augmented granger causality, in which the error correction term is added as an additional explanatory variable (Hatemi-J & Irandoust, 2001).

The paper is divided as follows: the next section provides a concise review of the literature plus a short historical background on the Brazilian Imperial period. Section 3 describes the data and the method used along with the empirical results. The conclusion corroborates a long-run relationship between government expenditures and revenues, and it sheds lights on the roles played by different rent-seeking groups.

## II. Historical Background

Brazil's monarchy foundations were set when the Portuguese Crown fled Portugal to Brazil in 1807. Portugal, allied with England, represented a breach in the continental blockage imposed by Napoleon. The entire crown—queen, prince, bureaucracy, nobles—fled Lisbon right before it fell to French troops. In March of 1808, 15,000 people arrived in Brazil. In 1821, King Dom João VI went back to Portugal leaving his son, Pedro, as the prince regent. In 1822, Dom Pedro I declared Brazil an independent country.

The transfer of the totality of the Portuguese crown was meant to establish all the bureaucratic Portuguese apparatus on Brazilian territory. Such institutional transplantation had consequences during the entire nineteenth century—

the century in which Brazil began and finished with the same income per capita, i.e., a period of stagnant economic growth. For instance, Engerman & Sokoloff (1997) show that in 1800 the GDP per capita in Brazil was of \$738; in 1913, Brazil had basically the same GDP per capita, i.e., \$700—an impressive century of zero growth.

Besides the moderate power (the King), the Imperial government had the traditional legislative (upper and lower houses), judiciary and executive branches. The Council of State was particularly important, with a wide range of regulatory powers. The lower house was composed of elective members. All other positions were appointed and were paid directly or indirectly by the King—even at Provincial and municipal levels. That was also true for the executive and judiciary. Therefore, the crown had considerable leverage to enforce mercantile regulations, unlike in the cases of England and the U.S. (Zanella et al, 2003; Ekelund & Tollison, 1997). Nonetheless, the Lower House wielded power on tax issues. As with the majority of countries during that time, participation in the Chamber was limited to wealthy and sometimes intellectual members of society.

Tax on exports, properties and sales were unusual or limited. The government relied basically on tax on imports; the crown supplemented its revenues by selling nobility titles (non-hereditary) and by currency debasement and seigniorage. After Brazil gained independence in 1822, taxes on goods imported from Portugal and England were equalized at 15%, while other countries paid 24%. In 1844, the Council of State enacted the Law *Alves Branco*, which increased tariffs on imported goods to 30% (no similar goods being produced domestically) and 60% (similar goods being produced domestically). This characteristic of the law demonstrates the rent-seeker group's influence.

### III. Data, Method and Empirical Results

Testing the direction and speed of the inflows and outflows of the government's budget rents is one of the few quantitative tests available for the period. This information conveys evidence on the roles of different interest groups. It is possible to execute short- and long- run Granger causalities between government revenues and expenditures by implementing a VECM (Granger, 1988). One limitation of a bivariate causality test is that a third variable may be simultaneously affecting the remaining variables, i.e. a misspecification bias. In this study, we add number of immigrants as the third variable, as it certainly affects government budget. Government revenues and expenditures plus number of immigrants are, to the extent of our knowledge, the only time series variables available for the study time frame. Immigration numbers are available as far back as 1836 from the *Instituto Brasileiro de Geografia e Estatística* ([www.ibge.gov.br](http://www.ibge.gov.br)). Government revenues and expenditures were obtained from Mitchell (1983). Finally, a dummy variable was added to account for the

Paraguay war (1865-1870); in this period government spending suffered a drastic spike.

The years just prior and after the war show a somewhat balanced budget, while in 1866 alone the expenditures are more than double the revenues. During the Paraguay war, Brazil, Uruguay and Argentina—with the support of England—fought against Paraguay. The last two years of the Imperial period, 1888-9, show quite a discrepancy regarding government expenditures and revenues, similar to those war years. This is related with two major events: slavery abolishment (1888) and the Declaration of the Republic in late 1889. For this reason, we added two dummies for those years. After these dummies, our VEC show residuals with normal distribution (normality test reported in Table II).

Government expenditures, revenues and immigration flows were normalized with natural logs. Next, all series were tested for unit roots. The Augmented Dick-Fuller (ADF) and Phillips-Perrot (PP) tests were applied with 2 lag lengths, the same length as indicated by the unrestricted VAR; and 3 lag lengths, as indicated by the Box-Jenkins process; and 4 lags as the maximum chosen by Schwarz information criterion. In any situation, results—omitted for concision purposes—show that series are I(1) considering test 1% critical values.

Final Prediction Error (FBE) and Akaike Information Criteria (AIC) were employed to test VAR lag length. FBE (0.000368) and AIC (-2.239360) results recommend 2 lag lengths at 5% level. Finally, the Johansen cointegration test was applied, as seen in Table I. Both trace test and max-eigenvalue test indicate 1 cointegrating equation at 5% level.

Table I: Johansen ML cointegration test

Hypothesized # of CE(s)	Trace Statistics	0.05 critical value	Max-Eigen Statistics	0.05 critical value
None*	23.534	15.494	21.554	14.262
At most 1	1.979	3.841	1.979	3.841

\* Denotes rejection of the hypothesis at 5% level.

The VECM included 2 lag lengths for expenditures and revenues, as indicated by FBE and AIC tests on the unrestricted VAR. Additionally, two exogenous variables were added. These are immigration, the only remaining time series available for the period, and a dummy to account for the Paraguay war. One lag length was added as well for both variables. Lastly, a VECM was run for the entire imperial period with data available (1836-1889) and for the period after the Law *Alves Branco* (1844-1889) that more than doubled tariffs on imports, significantly changing government revenues. Table II below shows the cointegration equations plus the residual tests.

Table II: Cointegrating Vectors and residual tests

	$\Delta \text{Exp}(-1)$	$\Delta \text{Rev}(-1)$	C	Auto-correlation	Hetero-skedasticity	Normality
Cointegration Eq. 1836-1889	1	12.426*** (0.000)	-0.538	1.870 (0.759)	45.676 (0.684)	1.681 (0.794)
Cointegration Eq. 1844-1889	1	5.269*** (0.000)	-0.261	5.667 (0.225)	41.192 (0.745)	7.032 (0.134)

Probabilities in between parenthesis; \*\*\* significant at 1% level; Autocorrelation: LM statistics with 3 lag lengths; Heteroskedasticity: White statistics with no cross-terms; Normality: Jarque-Bera statistics.  $\Delta$  denotes first difference; Exp= expenditures; Rev= revenues.

Results for the long-run variables are shown in Table III below. Results are elucidative. For the whole period (1836-1889), ECT shows 19% and 32% adjustment towards the equilibrium after one period, with a significance of 5% and 1% respectively. This is a clear corroboration of the co-integration. When expenditure is the endogenous variable, it shows that previous expenditures were highly significant while impacting *negatively* on current expenditures. These somewhat surprising results show that the government had little alternative to balancing the budget than by containing subsequent expenditures, a hard budget constraint. Results were reinforced by a lagged war variable; the current war, as expected, increased government expenditures. When revenues comprise the endogenous variable besides ECT, the only significant variable—at 5% level—is revenues (-1). This indicates that an increase in revenues tends to perpetuate the new level.

For the period after the tariffs increase (1844-1889), previous expenditures no longer had any effect on current expenditures, which was for the whole sample the most important factor along with war. These results suggest that after the tariffs increased, the crown did not balance the budget by cutting expenditures. Current expenditures were no longer negatively affected by previous expenditures—a government effort to contain expenditures—but were positively affected by previous revenues. War again shows the same effects as the previous model. When revenues were used as an endogeneous variable besides the highly significant ECT (1% level), only previous expenditures shows some positive effect.

Table III: VECM for 1836-1889 & 1844-1889

VECM	ECT	$\Delta\text{Exp}$ (-1)	$\Delta\text{Exp}$ (-2)	$\Delta\text{Rev}$ (-1)	$\Delta\text{Rev}$ (-2)	C	War	War (-1)	$\Delta\text{Imm}$	$\Delta\text{Imm}$ (-1)	Adj. R <sup>2</sup> F-Stat
1836	$\Delta\text{Exp}$	-0.195** (-2.35)	-0.330** (-2.17)	0.760 (1.66)	0.278 (0.826)	0.01 (0.31)	0.297** (2.10)	-0.307** (-2.07)	-0.011 (-0.40)	0.026 (1.04)	0.59 8.79***
	$\Delta\text{Rev}$	-0.321*** (-5.99)	0.01 (0.06)	0.757** (2.58)	0.361 (1.67)	-0.01 (-0.65)	0.053 (0.58)	0.102 (1.07)	0.015 (0.89)	0.01 (0.78)	0.66 11.20***
1844	$\Delta\text{Exp}$	-0.866*** (-4.08)	-0.139 (-0.86)	1.123*** (2.87)	0.712** (2.259)	-0.005 (-0.21)	0.368*** (2.89)	-0.258* (-1.88)	-0.006 (-0.29)	-0.027 (1.19)	0.66 10.11***
	$\Delta\text{Rev}$	-0.739*** (-4.23)	0.159 (1.20)	0.351 (1.09)	0.101 (0.39)	-0.025 (-1.14)	0.097 (0.92)	0.109 (0.96)	0.018 (0.95)	0.006 (0.35)	0.59 7.59***

$\Delta$  denotes first difference; ECT= error correction term; Exp= expenditures; Rev= revenues; Imm= immigration; -1 & -2 stands for 1 or 2 lag lengths; \*\*\* significance at 1%, \*\* significance at 5%, \* significance at 10%.

Finally, short- and long- run causality tests were performed using Wald F-statistics for the joint significance of the alternate casual variables; results are shown in Table IV. A trivariate causality test fails to show a statistical casual relationship among the variables in any direction, regardless of the period. When the augmented granger causality test is employed, results show a unidirectional causality from government expenditures to revenues—a spend-to-tax model, for 1836-1889. The effect of government revenues plus error correction term on government expenditures is significant only at the 10% level, here is considered 5% as the acceptable reference. When the period between 1844-1889 is analyzed, a bi-causality is corroborated at the 1% level. This is particularly consistent with the increase of the import tariffs in 1844.

Table IV: Results for short and long run Granger causality Tests

	Trivariate Granger Causality		Augmented Granger Causality		Trivariate Granger Causality		Augmented Granger Causality	
	1836-1889				1844-1889			
	$\chi^2$	P	$\chi^2$	P	$\chi^2$	P	$\chi^2$	P
Rev and Imm on Exp	4.50	0.34			5.54	0.23		
Exp and Imm on Rev	2.47	0.65			2.47	0.65		
Rev and ECT on Exp			7.17	0.07*			19.70	0.00***
Exp and ECT on Rev			37.03	0.00***			18.71	0.00***

\*\*\* significance at 1%, \* significance at 10%. ECT= error correction term; Exp= expenditures; Rev= revenues; Imm= immigration.

Overall, the ECTs show that after 1844, variables expenditures and revenues move back to their long-run relationship quite quickly, with adjustments of 86% and 73% in one period at 1% level significance. For the whole sample, containment of expenditures played an important role for the adjustment, while it had no significant impact after 1844. To contain expenditures meant a more difficult road. That is reflected with adjustments of 19% and 32% toward the equilibrium, a significant reduction in the adjustment dynamics. That is consistent with the results of the augmented causality test, in which previously the tariff increase of 1844 was supportive of the spend-to-tax model. For the sub-



sequent period, the augmented causality supports the bi-causality model at 1% level of significance either way.

## Conclusion

Quantitative tests on historical events are restricted, due to data limitation. One of the few available tests for the Brazilian imperial period involved government revenues and expenditures. The imperial government budget has been analyzed before with the intention to unveil clues regarding the interests groups (Zanella, 2007). The study showed that: a) in the Granger sense, the model supported was the spend-to-tax; and b) the government could not tax effectively because of local interest groups, in particular landowners. The study's shortcoming was using a bivariate causality test; a third variable might have affected both government revenues and expenditures, causing a misspecification bias.

The new study added immigration plus a dummy for war variables. Additionally, the sample was split to account for changes in tariffs in 1844. Furthermore, a new model was used—the VECM that reveals short- and long- run relationships among the variables. In the short run, the trivariate causality tests do not show any statistical relationship between government expenditures and revenues. In the long run, the VECM supports the spend-to-tax hypothesis for the whole period. After the law *Alves Branco* (1844), the VECM shows a bi-causality between revenues and expenditures. The new findings still support the idea that some pressure groups were safe from taxes. An emerging middle class, including a new wave of immigrants, were likely paying the new burden.

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