UFSM

ECONOMIA e DESENVOLVIMENTO

ISSN 2595-833X

OPEN ACCESS

Econ. e Desenv., Santa Maria, v. 35, e71713, p. 1-19, 2023 • https://doi.org/10.5902/1414650971713

Submitted: 19/09/2022 • Approved: 18/09/2023 • Published: 29/12/2023

Articles

Determinants of exports from Rio Grande do Sul between 1997 and 2021

Determinantes das exportações do Rio Grande do Sul entre 1997 e 2021

Carlos Gilbert Conte Filho[I]

[I] Universidade Federal de Santa Maria, Santa Maria, RS, Brasil

ABSTRACT

The present study presents an empirical analysis of the determinants of exports from Rio Grande do Sul between 1997 and 2021. Over the last 25 years, there has been a clear change in both the matrix of exported goods and the destination of exports of goods from RS. Using the Ordinary Least Squares methodology, the results found in the empirical analysis show that the expansion of exports to China contributes to the expansion of exports of primary sector goods. Consequently, this expansion is the determining factor for the decline in manufactured exports.

Keywords: Exports; Econometric analysis; Rio Grande do Sul

RESUMO

O presente estudo apresenta uma análise empírica dos determinantes das exportações do Rio Grande do Sul entre 1997 e 2021. Nos últimos 25 anos, houve uma clara mudança tanto na matriz de bens exportados quanto no destino das exportações de mercadorias do RS. Utilizando a metodologia de Mínimos Quadrados Ordinários, os resultados encontrados na análise empírica mostram que a expansão das exportações para a China contribui para o aumento das exportações de bens do setor primário. Consequentemente, essa expansão é o fator determinante para a queda das exportações manufaturadas.

Keywords: Exportações; Análise econométrica; Rio Grande do Sul

INTRODUCTION

Rio Grande do Sul (hereinafter RS) is one of the main states in terms of exports from Brazil. In 2021, RS was the seventh largest exporter among all federative units and, alone, generated a surplus of US$ 9.3 billion in the Brazilian trade balance (Comex Stat, 2022). Despite the good performance, however, over the last few years, RS exports reflect two changes in the dynamics of the state's economy: the change in the list of exported goods and the change in the main destination of these exports.

Analyzing the list of exports from RS over the last few years, one can observe the expansion of exports of primary goods to the detriment of manufactured goods. In RS, between 2010 and 2021, exports from the agricultural sector showed an average growth of 12.98% per year; while exports from the manufacturing industry and mining and quarrying industry showed average growth of -1.95% and 5.8%, respectively. Thus, if in 2010, the manufacturing industry represented 84.6% of RS exports, in 2021, the relative share of this sector was 66.49% (a drop of 21.45% in the period). On the other hand, agriculture accounted for 13.5% of exports in 2010 and, in 2021, represented 32.89% (an increase of 142%).

In addition to the gradual change in the list of exported goods, the destination of Rio Grande do Sul's exports has also changed over the last few decades. Until 2009, the US was the main course of state-produced goods. However, after the 2009 financial crisis (subprime[1]), China consolidated itself as RS's main trading partner. In 2021, the Asian country represented more than 37% of the state's exports, making it the main destination for primary goods produced by RS (especially soybeans and frozen pork) (ComexStat, 2022).

[1] Crisis that began in the American real estate market in the third quarter of 2008 and lasted until the middle of 2009, impacting several countries through the contagion effect. It resulted in a financial crisis and, consequently, in the fall of the American GDP. Official data from the United States show that the change in GDP has shown negative values since the first quarter of 2008 (fall of 0.7%), with modest growth in the second quarter (0.6%) of 2008 and, thereafter, falls in the four subsequent quarters: -4.0%, -6.8%, -4.9% and -0.7%, respectively. As of the third quarter of 2009, GDP grew by 1.6%. The unemployment rate in December 2009 was 9.9%, one of the highest in the entire series released by the Bureau of Labor Statistics (BLS) (Bastos and Mattos, 2011).

In a globalized commercial environment, exports play an important role in the growth and development of economies. The economic literature highlights that the positive effect of exports occurs in two ways: one direct and the other indirect (Balassa, 1978). The direct effect is due to exports on aggregate demand, so that the increase in exports promotes an increase in the region's Gross Domestic Product (GDP). Thirwall (2005) highlights that exports are the only autonomous component, on the demand side, that can lead to economic growth independent of factors internal to the economy. The indirect (or dynamic) effect, in turn, occurs since greater openness to international trade will enhance productive efficiency, as a result of better use of economies of scale and better allocation of the economy's resources (Carmo, Raiher, Stege, 2017). In other words, technological intensity has a significant impact on the international trade agenda. A country that exports more technology-intensive products (which translates into greater exports of goods from the manufacturing industry) results in a more developed industrial sector, impacting more robust growth rates. However, it also results in a greater spillover of knowledge, which allows other sectors to benefit as well. On the other hand, economies that have an export agenda predominantly with products of low technological intensity – that is, with a substantial share of primary goods – perceive limited growth due to the reduced scope for technological improvements (Sacaro and Alvim, 2017).

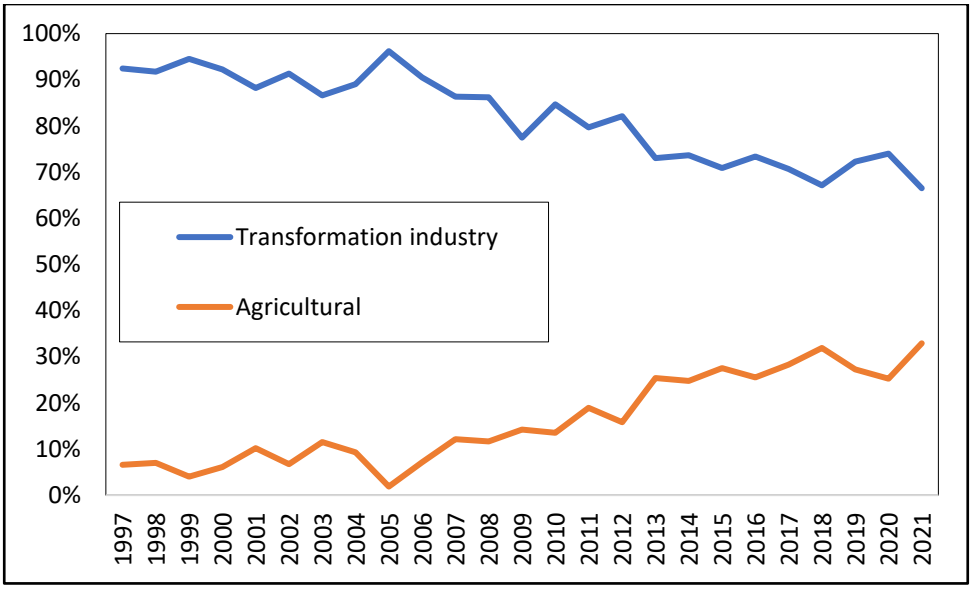
Therefore, the main objective is to analyze the factors that influenced the expansion of exports of Rio Grande do Sul in primary goods over the last two decades. It is intended to point out: i) how the expansion of exports to China has impacted the exports of RS and ii) is the expansion of the primary goods list a result of the fall in exports of manufactured goods or a determining factor for the drop in these? To this end, this article is divided into three more sections in addition to this introduction. In section two, the numbers of the external sector referring to the economy of RS are presented. In section three, an empirical analysis is carried out on the determinants of exports from the state of Rio Grande do Sul. Finally, there are the final considerations.

2 EXPORTS FROM RIO GRANDE DO SUL

The list of goods exported by any economy is divided into three sectors: agriculture, the extractive industry, and the transformation industry. The agricultural sector is one of the areas of the primary sector responsible to produce consumer goods. It is exercised mainly by small producers who combine agricultural techniques (plant and vegetable cultivation) with livestock (cattle, swine, poultry, horses). The extractive industry, in turn, takes raw materials from nature to be used in other industries. This is divided between the vegetable extractive industry and the mineral extractive industry. The first is to collect fruits, wood and roots from nature. The second is characterized by the exploitation of underground mineral resources, such as gold, oil and iron ore. The manufacturing industry, on the other hand, is the industrial production sector focused on the transformation of raw materials into goods. It covers all stages of industrial production: raw materials (steel), capital goods (machine tools and auto parts) and consumer goods (cars and clothing). This category includes agro-industrial production, such as sugar, juices and processing of agricultural products (Sandroni, 2005).

Over the last few decades, RS has shown a change in the matrix of exported goods. This deindustrialization is evident in the trade balance. If in 1997 the agricultural sector represented 6.58% of the state's exports, in 2021 the exported quota was 32.90%. At the same time, the manufacturing industry showed a drop in the number of exports. In 1997, the sector represented 92.42% of RS's export agenda and, in 2021, 66.50% (figure 1). As for the extractive industry, it represented, between 1997 and 2021, an annual average of less than 1% of the total exported by RS.

Figure 1 – Participation of the processing industry and agriculture in RS exports between 1997 and 2021

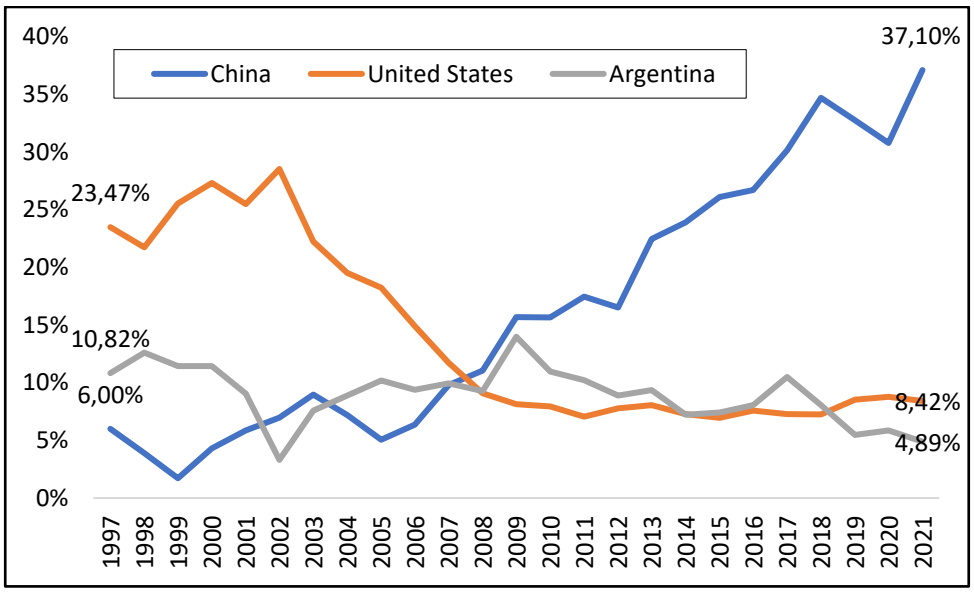


Source: ComexStat (2022)

In parallel with the fall in the share of goods from the manufacturing industry and the increase in goods exported by the agricultural sector, there was also a change in the main destination of exports carried out by RS. Over the last few years, Argentina, China, and the United States have emerged as RS's main trading partners.

Between 1997 and 2008, the US was the main destination for exports from the state of Rio Grande do Sul. However, after the 2008 financial crisis, China became RS's main trading partner. Currently, China represents 37.10% of the total exported by the state; while the USA – which once represented more than 30% of the contingent exported by RS – in 2021, accounted for 8.42% of Rio Grande do Sul exports. As for Argentina, in 1997, the neighboring country was responsible for 10.82% of the total exported by the state, while in 2021, this number was 4.89% (figure 2).

Figure 2 – Main destination of RS exports between 1997 and 2021



Source: ComexStat (2022)

As for exported goods, it is observed that there was a change in the items sold by RS between 1997 and 2021. In the agricultural sector, at the end of the 1990s, soy was already emerging as the main item on the agenda. However, it represents 5% of the total exported by RS. Nevertheless, the weight of this commodity in the export list, over 25 years, came to represent more than 29% of the total traded by the state. As for the processing industry, bagasse, and other solid residues from the extraction of soy fats or oils added to tobacco, completely or partially descaled or denervated, represented around 22% of the RS exports (9.33% and 13.29%, respectively). However, in 2021, these items represented no more than half of what was exported at the end of the 1990s (5.54% and 5.12%, respectively). Attachment 1 presents the exports of these items.

It is observed, therefore, that between 1997 and 2021 there was a change in the list of goods exported by RS. There was a fall in the share of the main exported goods from the manufacturing industry and an increase in goods from agriculture, especially soybeans.

3 EMPIRICAL ANALYSIS

In this section, an empirical analysis of the determinants of exports from Rio Grande do Sul is carried out. The aim is to point out what are the effects that exports to the main trading partners of RS, the domestic real interest rate, the real exchange rate, and the degree of uncertainty present in the Brazilian economy exerted on each exporting sector of the economy of Rio Grande do Sul. Furthermore, the aim of this section is to point out the causality between the exporting sectors, that is, to point out whether the exports of one sector precede the effects on the export of another sector of the economy of Rio Grande do Sul. The time frame of the analysis ranges from 1997 to 2021. This period was chosen based on the availability of data.

Four equations will be tested: a general equation and three referring to each of the exporting sectors of the state's economy. All of them were transformed into rates to obtain the elasticities. The equations are presented below:

$$X_{RS} = f\left(X_{China}, X_{EUA}, X_{Argentina}, r, E, Inst\right) \quad (1)$$

$$X_{Agr} = f\left(X_{China}, X_{EUA}, X_{Argentina}, r, E, Inst\right) \quad (2)$$

$$X_{IE} = f\left(X_{China}, X_{EUA}, X_{Argentina}, r, E, Inst\right) \quad (3)$$

$$X_{IT} = f\left(X_{China}, X_{EUA}, X_{Argentina}, r, E, Inst\right) \quad (4)$$

Where:

X_{RS}= natural logarithm of total exports from RS (in US$);

X_{Agr}= share of agricultural exports in the total exported by RS;

X_{IE}= share of exports of goods from the extractive industry in the total exported by RS;

X_{IT}= share of exports of goods from the manufacturing industry in the total exported by RS;

X_{China}= share of RS exports to China over the total exported by the state;

X_{EUA}= share of RS exports destined for the USA over the total exported by the state;

$X_{Argentina}$= share of RS exports destined for Argentina over the total exported by the state;

r= real interest rate of the Brazilian economy;

E= real exchange rate;

$Inst$= instability present in the Brazilian economy.

For the series referring to the real exchange rate and for the series referring to the uncertainty of the Brazilian economy, the equations below were applied:

$$E = CN.\left(\frac{\pi_{EUA}}{\pi_{BR}}\right) \quad (5)$$

$$Inst = (1 + \pi_{BR}) + \Delta r + \Delta E \quad (6)$$

Where:

CN= nominal exchange rate (average sale) R$/US$;

π_{EUA}= inflation in the US economy;

π_{BR}= inflation in the Brazilian economy (IGP-DI);

Δr= variation in the nominal interest rate of the Brazilian economy;

ΔE= nominal exchange rate in Brazil.

To carry out the empirical analysis, the time series were obtained from the ComexStat, Ipeadata and Brazilian Central Bank databases.

The first step of the econometric analysis was to verify if the time series are stationary in level. For this purpose, two tests were applied: the Augmented Dickey-Fuller (ADF) unit root test and the Phillips-Perron (PP) unit root test. Both were applied assuming that there is an intercept in the time series. The result is in the table below:

Table 1 – Unit Root Test ADF and PP

(continued)

Variable	**ADF**		**PP**		**Integration Order**
	Statistic	P-value	Statistic	P-value	
$\boldsymbol{X_{RS}}$	-0.981443	0.7430	-0.920664	0.7637	I (1)
D ($\boldsymbol{X_{RS}}$)	-4.570312	0.0016	-4.516687	0.0018	
$\boldsymbol{X_{Agr}}$	-0.559846	0.8621	0.023745	0.9520	I (1)
D ($\boldsymbol{X_{Agr}}$)	-6.558653	0.0000	-8.119832	0.0000	
$\boldsymbol{X_{IE}}$	-5.140409	0.0004	-5.141701	0.0004	I (0)

(conclusion)

Variable	ADF		PP		Integration Order
	Statistic	P-value	Statistic	P-value	
X_{IT}	-0.443424	0.8855	-0.327873	0.9067	I (1)
D (X_{IT})	-7.341859	0.0000	-9.344522	0.0000	
X_{China}	0.703619	0.9896	1.594899	0.9991	I (1)
D (X_{China})	-4.753496	0.0010	-4.874937	0.0008	I (1)
X_{EUA}	-1.042183	0.7209	-1.078582	0.7070	I (1)
D (X_{EUA})	-2.612279	0.1088	-4.255662	0.0032	I (1)
$X_{Argentina}$	-2.282364	0.1852	-2.282364	0.1852	I (1)
D ($X_{Argentina}$)	-5.706375	0.0001	-6.034681	0.0001	I (1) I (0)*
r	-2.869265	0.0639	-2.779427	0.0762	I (1)
E	-1.328193	0.5993	-1.251657	0.6344	I (1)
D (E)	-4.679997	0.0012	-4.730644	0.0011	I (1)
$Inst$	-4.549859	0.0015	-4.534442	0.0016	I (0)

Source: Results generated by E-views 10 (2022)
Note: * indicates that, at the 10% significance level, the time series is stationary at the level

From the unit root tests, it can be observed that – except for Rio Grande do Sul's exports from the extractive industry sector, the real interest rate and the instability of the economy – all others presented unit root. As some of the time series included in the model need to be differentiated to become stationary, the methodology that fits this need must be chosen.

Due to the small number of available observations (each time series has 25 observations), it was decided to differentiate the series that have a unit root (that is, to apply the first difference in the time series that were not stationary in level).

With the stationary time series in hand, the Ordinary Least Squares[2] (OLS) methodology was implemented. The result of the proposed models is presented in table two:

[2] The OLS methodology requires that the time series be stationary at the level.

Table 2 – Estimated Regressions

Variable	Equation 1 (X_{RS})	Equation 2 (X_{Agr})	Equation 3 (X_{IE})	Equation 4 (X_{IT})
$X_{Argentina}$	-0.754556 (0.5728)[c]	0.018453 (0.9496)[c]	-0.001733 (0.8736)[c]	-0.414633 (0,2024)[c]
X_{China}	3.197060 (0.0050)[a]	1.342168 (0.000)[a]	-0.004333 (0.5998)[c]	-1.478074 (0.0000)[a]
X_{EUA}	-3.550580 (0.0114)[a]	-0.537465 (0.0667)[b]	-0.008609 (0.4118)[c]	0.325765 (0.0898)[c]
r	0.414428 (0.2308)[c]	0.060991 (0.4158)[c]	-0.002198 (0.4314)[c]	-0.066463 (0.4146)[c]
E	0.088831 (0.0268)[a]	0.005578 (0.4972)[c]	5.8E-05 (0.8477)[c]	0.007704 (0.3902)[c]
$Inst$	0.004961 (0.9524)[c]	-0.002181 (0.9048)[c]	0.000823 (0.2359)[c]	0.002929 (0.8825)[c]
Constant	-0.124266 (0.4249)[c]	-0.018839 (0.5793)[c]	-0.000889 (0.4844)[c]	0.016512 (0.6543)[c]
Coefficient of determination (R^2)	0.6273	0.7598	0.1283	77.30

Source: Results generated by E-views 10 (2022)
Note: values in parentheses refer to the probability of accepting the null hypothesis (H0: βi = 0)
a indicates that the estimated parameter is significantly different from zero at the 5% level
b indicates that the estimated parameter is significantly different from zero at the 10% level
c indicates that the estimated parameter is not significantly different from zero

The coefficients estimated in equation 1 – in which the explained variable is the logarithm of total exports from RS – show that: i) a 1% increase in exports to China increases total RS exports by 3,197%; ii) the 1% increase in exports to the US reduces total exports from RS by -3,550%; iii) for every 1% of devaluation of the real exchange rate (R$/US$), these cause an increase in total exports from RS in the order of 0.088%. The other estimated coefficients were not statistically significant. Finally, the estimated model explains 62.73% of the variations in RS exports between 1997 and 2021.

The coefficients estimated in equation 2 – in which the explained variable is the rate of exports from the agriculture sector in RS – shows that: i) a 1% increase in exports to China increases by 1.342% exports from the agricultural sector in RS and ii) the 1% increase in exports to the US reduces by -0.537% exports from the agriculture sector in RS. The other estimated coefficients were not statistically

significant. Finally, the estimated model explains 75.98% of the variations in exports of the agricultural sector in RS between 1997 and 2021.

The coefficients estimated in equation 3 – in which the explained variable is the rate of exports from the extractive industry sector in RS – did not generate statistically significant estimated coefficients. However, the estimated model explains by 12.83% the variations in exports of the extractive industry in RS between 1997 and 2021.

The coefficients estimated in equation 4 – in which the explained variable is the rate of exports of the manufacturing industry sector in RS – shows that: i) a 1% increase in exports to China reduces industry exports by -1,478%. of transformation of the RS RS and ii) the 1% increase in exports to the USA increases the RS manufacturing industry's exports by 0.325%. The other estimated coefficients were not statistically significant. Finally, the estimated model explains 77.30% of the variations in RS manufacturing industry exports between 1997 and 2021.

After estimating the models, it is necessary to observe the behavior of the error term of each of the equations. The Ordinary Least Squares (OLS) methodology requires, to estimate consistent coefficients, that the error term is of the BLUE[3] type in order to estimate the best unbiased linear estimators. BLUE type errors have the following characteristics:1) the average value of the random error must be ZERO: $E(e) = 0$;; 2) the error variance must be constant along the estimated line: $var(e) = \sigma^2$;; 3) the error terms found cannot be correlated: $cov(e_i, e_j) = 0$; 4) the variable X is not random and must contain at least two different values; 5) the values of the error term (e) are normally distributed around their mean (a non-mandatory condition). The results of the descriptive statistics for the error term are presented in table thee:

[3] Blue errors (best linear unbiased estimator) means that the model is generating the best possible estimators.

Table 3 – Descriptive statistics of the estimated error term in the OLS regression

Descriptive Statistics	**Equation 1 (X_{RS})**	**Equation 2 (X_{Agr})**	**Equation 3 (X_{IE})**	**Equation 4 (X_{IT})**
Average	4.63E-18	-1.45E-19	1.93E-19	4.75E-18
Maximum Observed Value	0.154935	0.036736	0.003320	0.045638
Minimum Value Observed	-0.130885	-0.041336	-0.000602	-0.043934
Jarque-Bera Test	1.757495 (0.415303)	0.411695 (0.813957)	228.1097 (0.0000)	0.097204 (0.952560)
Number of Observations	24	24	24	24

Source: Results generated by E-Views 10 (2022)
Note: Values in parentheses refer to the probability of accepting the null hypothesis

From the results obtained, it is possible to observe that the error term, in the four equations, have a mean close to zero. Furthermore, there must be at least two terms with different values. According to the results, in all equations there were 24 observations. Furthermore, in the four equations, the observation that presents the maximum value is different from the one that presents the minimum value. As for the distribution of the error term (Jarque-Bera Test), the results show that, except for equation 3 (in which the explanatory variable is the share of exports from the extractive industry), all the other three equations presented normally distributed errors[4].

To test whether the equations generated uncorrelated error terms, the Breusch-Godfrey LM serial correlation test was applied. The test result is shown in table four:

[4] The probability of rejecting the null hypothesis is greater than 5%.

Table 4 – Breusch-Godfrey LM serial autocorrelation test

	Equation 1 (X_{RS})	**Equation 2 (X_{Agr})**	**Equation 3 (X_{IE})**	**Equation 4 (X_{IT})**
F statistic	0.514079	0.164349	0.514743	0.750838
Probability of accepting the null hypothesis	0.6082	0.8500	0.6078	0.4889

Source: Results generated by E-Views 10 (2022)

In all equations, the LM test result for serial autocorrelation showed that the probability of accepting the null hypothesis was greater than 5%. Therefore, it can be said that the estimated models do not present autocorrelated errors.

To test whether the error variance in the equations is homoscedastic, that is, if the variance is constant, the ARCH heteroscedasticity test was used. The result of this test is shown in table five:

Table 5 – ARCH heteroscedasticity test

	Equation 1 (X_{RS})	**Equation 2 (X_{Agr})**	**Equation 3 (X_{IE})**	**Equation 4 (X_{IT})**
F statistic	0.06752	0.954090	0.071602	1.376457
Probability of accepting the null hypothesis	0.7975	0.3398	0.7916	0.2538

Source: Results generated by E-Views 10 (2022)

According to the results, it is observed that the probability of accepting the null hypothesis (there is no heteroscedasticity in the model) is always greater than 5%. That is, for the four equations, it can be said that the observations of the error term are homoscedastic.

From the results presented, it is concluded that the four regressions estimated through the OLS methodology generated consistent estimators (BLUE type).

The last step of the empirical analysis was to apply the Granger causality test. The basic idea behind the Granger test is to assume that the future cannot cause the past or the present. That is, the fundamental question is whether the scalar Y

helps to predict the scalar Z. If it does not, then Y is said to be non-Granger-causes Z. Thus, the Granger causality test assumes that the relevant information for the forecast of the respective variables Y and Z is contained only in the time series on these two variables. Thus, a stationary time series Y causes, in the Granger sense, another variable Z if better statistically significant predictions of Y can be obtained by including lagged values of Z to lagged values of Y. lags in each of the time series (seven is the maximum number of lags that the available observations make it possible to carry out the test), since the change in exports from one sector of the Rio Grande do Sul economy takes a long period of time to have an effect on another sector. The result of the Granger causality test is shown in Table six:

Table 6 – Granger Causality Test

Null hypothesis	**Number of observations**	**F statistic**	**Probability of rejecting the null hypothesis**
X_{Agr} does not cause Grange in X_{IT}	17	46.6635	0.0211
X_{IT} does not cause Grange in X_{Agr}		4.71999	0.1859
X_{IE} does not cause Grange in X_{IT}	17	1.08393	0.5591
X_{IT} does not cause Grange in X_{IE}		1.32039	0.4962
X_{IE} does not cause Grange in X_{Agr}	17	0.80871	0.6532
X_{Agr} does not cause Grange in X_{IE}		0.84274	0.6401

Source: Results generated by E-Views 10 (2022)

Based on the result of the Granger causality test, it can be said that the variations in exports of the agricultural sector carried out by RS between 1997 and 2021 affect the performance of exports in the manufacturing sector. In other words, in the period under analysis, the expansion of exports from the agricultural sector caused a drop-in export from the manufacturing sector.

4 FINAL REMARKS

This article sought to demonstrate the determinants of exports in the state of Rio Grande do Sul between 1997 and 2021. The data available on the ComexStat portal powered by the Ministry of Industry, Foreign Trade and Services indicate that Rio Grande do Sul has been experiencing a process of reducing exports of manufactured goods that arises from the increase in exports of primary goods. The factor that led to this change in the pattern of goods exported by RS is inevitably the state's main trading partner. Until the subprime crisis, which began in 2008, the US was the main buyer of goods from RS. From that date, however, China appears as the preponderant country of destination for goods produced by the state of Rio Grande do Sul. And, from this change, we can see the expansion of exports of goods from the agricultural sector, especially with the export of soybeans.

In this sense, econometric tests show that the expansion of goods exported to China contributes more than 3% to the expansion of total exports from RS, while expanding exports to the US reduces the state's total exports by 3.55%. Furthermore, the 1% increase in exports to China reflects a 1.3% increase in exports from the agricultural sector but reduces exports from the manufacturing industry by 1.47%. At the same time, the 1% increase in exports to the US increases exports from the manufacturing sector by 0.32% but reduces exports from the agricultural sector by 1.47%. Finally, the causality test showed that the increase in exports from the agricultural sector precedes the reduction in exports from the manufacturing industry.

From these results, increasing exports to China have induced RS exports to focus on primary goods. And this may be one of the factors that contribute to the deindustrialization of RS over the last few years. Therefore, an imperative research agenda is to assess the impact that exports to China have on the development of the industry in Rio Grande do Sul.

REFERENCES

BALASSA, Bela. **Exports and economic growth**: further evidence. Journal of Development Economics. v. 5, n. 2, 1978.

BANCO CENTRAL DO BRASIL. Available in: http://www.bcb.gov.br Accessed on April 2, 2022.

BASTOS, Carlos Pinkusfeld; MATTOS, Fernando Augusto Mansor de. Crise subprime nos Estados Unidos: a reação do setor público e o impacto sobe o emprego. **Revista Tempo do Mundo**, v. 3, n. 2, 2011.

BELLO, Teresinha da Silva. As exportações do RS em 2003. **Indicadores Econômicos FEE**, Porto Alegre, v. 31, n. 4, 2006.

BELLO, Teresinha da Silva; TERUCHKIN, Sônia Unikowsky. As exportações do RS em 2005. **Indicadores Econômicos FEE**, Porto Alegre, v. 33, n. 4, 2006.

BELLO, Teresinha da Silva; TERUCHKIN, Sônia Unikowsky. As exportações gaúchas em 2006: crescimento apesar das dificuldades. **Indicadores Econômicos FEE**, Porto Alegre, v. 34, n. 4, 2007.

BRAGA, Laercio Pereira. A influência da taxa de câmbio e renda mundial sobre as exportaçoes brasileira de soja (2010 – 2015). **Revista de Economia e Sociologia Rural**. v. 56, n. 4, 2018.

BUENO, Rodrigo de Losso da Silva. **Econometria de séries temporais**. 3. ed. São Paulo: Cengage Learning, 2011.

CALDAS, Bruno Breyer. O desempenho das exportações gaúchas em 2012. **Indicadores Econômicos FEE**. v. 40, n. 4, 2013.

COMEX STAT. Available in: https://comexstat.midic.gov.br Accessed on April 4, 2022.

DA SILVA, José Alderir. Desindutrialização e doença holandesa: o caso brasileiro. **Indicadores Econômicos FEE**. v. 41, n. 3, 2014.

DO CARMO, Alex Sander Souza; RAIHER, Augusta Pelinski; STEGE, Alysson Luiz. O efeito das exportações no crescimento econômico das microrregiões brasileiras: uma análise espacial com dados em painel. **Estudos Econômicos**. v. 47, n. 1, 2017.

FAVARETTO, Letícia; FAVARETTO, Juliana; GELATTI, Elisangela; CORONEL, Danieal Arruda; FREITAS, Claiton Ataídes; COPETTI, Leonardo Sangoi. Análise econométrica da influência da taxa de câmbio e da renda externa sobre as exportações dos produtos básicos do estado do Rio Grande do Sul (2001-2018). **Sinergia – Revista do Instituto de Ciências Econômicas, Administrativas e Contábeis**, v. 25, n. 1, 2020.

FUNDAÇÃO DE ECONOMIA E ESTATÍSTICA SIEGFRIED EMANUEL HEUSER (FEE). Available in: https://arquivofee.rs.gov.br Accessed on April 10, 2022.

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA. Available in: https://ibge.gov.br Accessed on April 6, 2022.

IPEADATA: base de dados macroeconômicos. Available in: https://ipeadata.gov.br Accessed on April 4, 2022.

NAKABASHI, Luciano; CRUZ, Marcio José Vargas; SCATOLIN, Fabio Dória. Efeitos do Câmbio e Juros sobre as Exportações da Indústria Brasileira. **Revista de Economia Contemporânea**, v. 12, n. 3, 2008.

PATTERSON, Kerry. **An introduction to applied econometrics**: a time series approach. New York: St. Martin's Press, 2000.

PEREIRA, Wellington; PORCILE, Gabriel; FURTADO, João. Competitividade internacional e tecnologia: uma análise da estrutura das exportações brasileiras. **Economia e Sociedade**, v. 20, n. 3, 2011.

SACCARO, Alice; ALVIM, Augusto Mussi. Análise das exportações gaúchas, de acordo com a intensidade tecnológica, mediante um modelo VAR. **Indicadores Econômicos FEE**, v. 44, n. 3, 2017.

THIRLWALL, Anthony Philip. **A Natureza do Crescimento Econômico**: um referencial alternativo para compreender o desempenho das nações. Brasília: Ipea, 2005.

VERBEEK, Marno. **A guide to modern econometrics**. West Sussex: John Wiley and Sons, 2005.

Contribuição de autoria

1 – Carlos Gilbert Conte Filho
Doutor em Economia da Indústria e da Tecnologia pela Universidade Federal do Rio de Janeiro, Brasil
https://orcid.org/0000-0003-3753-9723 • cgconte@terra.com.br
Contribuição: Escrita – Primeira Redação

Como citar este artigo

CONTE FILHO, Carlos Gilbert. Determinants of exports from Rio Grande do Sul between 1997 and 2021. **Econ. e Desenv.**, Santa Maria, v. 35, e71713, 2023. DOI 10.5902/1414650971713. Disponível em: https://doi.org/ 10.5902/1414650971713. Acesso em: XX/XX/XXXX.

Attachment 1

Table 1 – Main Goods on the Export Tariff of RS in the Agriculture and Manufacturing Sector between 1997 and 2021

	Agricultural					**Transformation Industry**				
	Soy	Other unmilled wheat and rye	Rice with pell	Herb tea	Woods	Bagasse and Other waste	Tobacco	Chemical pastes	Swine meat	Bird cuts or other spoils
1997	5.00%	0.00%	0.00%	0.23%	0.00%	9.33%	13.29%	1.00%	0.49%	1.42%
1998	5.21%	0.00%	0.00%	0.42%	0.00%	6.26%	12.27%	1.09%	0.74%	1.35%
1999	2.09%	0.00%	0.00%	0.43%	0.06%	5.21%	13.61%	1.81%	0.76%	1.82%
2000	4.61%	0.00%	0.00%	0.35%	0.09%	3.44%	11.10%	2.14%	0.86%	1.54%
2001	7.64%	0.00%	0.00%	0.33%	0.05%	4.82%	11.70%	1.18%	1.05%	2.93%
2002	5.47%	0.00%	0.00%	0.24%	0.10%	5.16%	12.72%	1.28%	1.26%	3.16%
2003	10.49%	0.09%	0.00%	0.15%	0.02%	4.42%	11.06%	1.10%	1.55%	3.44%
2004	6.40%	1.73%	0.00%	0.14%	0.00%	4.03%	11.64%	1.06%	1.95%	4.48%
2005	1.03%	0.00%	0.00%	0.19%	0.00%	2.73%	12.88%	1.07%	2.63%	5.49%
2006	6.31%	0.08%	0.00%	0.10%	0.00%	2.83%	9.18%	1.06%	4.79%	4.14%
2007	10.79%	0.19%	0.00%	0.13%	0.00%	3.14%	9.81%	0.92%	4.28%	3.97%
2008	9.27%	1.17%	0.00%	0.14%	0.00%	3.89%	10.26%	0.92%	3.89%	3.75%
2009	12.74%	0.31%	0.07%	0.15%	0.00%	4.47%	13.01%	0.81%	3.00%	3.12%
2010	11.65%	0.74%	0.00%	0.17%	0.00%	5.45%	11.03%	1.17%	3.38%	3.58%
2011	15.30%	2.33%	0.22%	0.19%	0.00%	6.08%	9.13%	0.93%	2.27%	3.33%
2012	11.40%	2.58%	0.22%	0.30%	0.00%	6.66%	12.08%	0.80%	2.25%	3.52%
2013	20.86%	1.61%	0.50%	0.37%	0.00%	5.93%	10.75%	0.70%	1.83%	2.82%
2014	21.38%	0.52%	0.52%	0.48%	0.00%	6.21%	9.44%	0.69%	2.27%	3.07%
2015	23.92%	1.81%	0.29%	0.47%	0.00%	5.73%	8.69%	1.79%	2.33%	2.57%
2016	23.31%	0.56%	0.31%	0.41%	0.02%	5.47%	9.51%	3.66%	2.62%	3.09%
2017	26.06%	0.58%	0.17%	0.36%	0.01%	3.57%	8.48%	2.40%	2.60%	3.22%
2018	28.98%	0.22%	0.94%	0.38%	0.03%	5.36%	7.82%	4.39%	1.37%	1.69%
2019	23.97%	0.64%	0.37%	0.38%	0.09%	4.51%	9.43%	7.36%	2.25%	2.83%
2020	20.94%	0.79%	0.93%	0.48%	0.16%	5.65%	8.38%	4.57%	4.30%	3.63%
2021	29.43%	1.23%	0.34%	0.33%	0.31%	5.54%	5.12%	4.75%	3.26%	3.03%

Source: ComexStat (2022)

To visualize better the table click here.

Attachment 2

	X_T	X_{IT}	X_{IE}	X_{Agr}	X_{EUA}	X_{Chi}	X_{Agr}	RR	E	$Inst$
1997	$6,267,496,953	92.42%	0.01%	6.58%	23.47%	6.00%	10.82%	29.69%	R$ 0.38	2.065901
1998	$5,626,536,764	91.77%	0.02%	6.97%	21.74%	3.87%	12.59%	27.12%	R$ 0.59	2.24424
1999	$4,994,940,581	94.52%	0.04%	4.03%	25.54%	1.71%	11.43%	42.62%	R$ 0.81	2.570535
2000	$5,770,544,520	92.24%	0.01%	6.09%	27.30%	4.31%	11.44%	25.90%	R$ 0.94	1.901768
2001	$6,341,332,668	88.21%	0.01%	10.20%	25.48%	5.85%	9.04%	26.43%	R$ 0.96	2.286903
2002	$6,372,043,386	91.31%	0.01%	6.74%	28.52%	6.96%	3.30%	44.01%	R$ 0.66	2.88476
2003	$8,009,358,402	86.64%	0.01%	11.53%	22.22%	8.98%	7.58%	28.77%	R$ 0.45	2.093299
2004	$9,875,302,363	89.07%	0.01%	9.30%	19.52%	7.20%	8.88%	27.21%	R$ 1.08	1.754307
2005	$10,445,921,164	96.20%	0.01%	1.86%	18.22%	5.05%	10.20%	18.74%	R$ 1.16	2.056638
2006	$11,709,557,288	90.50%	0.02%	7.14%	14.92%	6.35%	9.39%	17.88%	R$ 1.65	1.755557
2007	$14,890,390,055	86.31%	0.01%	12.12%	11.72%	9.81%	9.93%	19.11%	R$ 1.39	1.703717
2008	$17,444,450,060	86.23%	0.42%	11.67%	9.07%	11.04%	9.26%	20.83%	R$ 1.58	2.455786
2009	$15,200,526,946	77.46%	0.01%	14.22%	8.14%	15.68%	13.98%	8.02%	-R$ 0.13	1.536389
2010	$15,303,557,689	84.66%	0.02%	13.55%	7.93%	15.64%	10.97%	20.65%	R$ 0.54	2.059344
2011	$19,361,408,798	79.71%	0.03%	18.91%	7.05%	17.47%	10.20%	16.02%	R$ 0.89	2.354377
2012	$17,328,522,067	82.15%	0.03%	15.82%	7.78%	16.50%	8.88%	16.20%	R$ 0.78	1.905396
2013	$20,263,647,149	73.04%	0.03%	25.35%	8.05%	22.46%	9.35%	13.30%	R$ 0.55	2.162044
2014	$18,647,959,217	73.66%	0.03%	24.73%	7.28%	23.89%	7.20%	14.10%	R$ 0.68	2.498182
2015	$17,118,410,215	70.87%	0.02%	27.54%	6.95%	26.09%	7.42%	23.22%	R$ 0.05	2.790259
2016	$16,191,167,710	73.35%	0.02%	25.54%	7.58%	26.69%	8.05%	20.35%	R$ 0.47	1.958382
2017	$17,782,259,365	70.67%	0.02%	28.25%	7.28%	30.14%	10.50%	9.09%	R$ 2.04	1.732914
2018	$18,205,376,860	67.12%	0.04%	31.86%	7.23%	34.70%	8.04%	13.33%	R$ 2.58	1.897436
2019	$17,256,957,530	72.29%	0.04%	27.22%	8.52%	32.75%	5.47%	13.49%	R$ 1.96	2.046568
2020	$14,059,629,221	74.02%	0.03%	25.27%	8.78%	30.78%	5.87%	25.80%	R$ 2.00	1.52481
2021	$21,133,421,744	66.50%	0.03%	32.90%	8.42%	37.10%	4.89%	20.88%	R$ 3.16	2.405643

Source: ComexStat (2022)

To visualize better the table click here.