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Centro de Filosofia e Ciências Humanas
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**Beyond borders: How spatial spillover effects shape the role of pork barrel politics on
subnational public policy provision**

AMANDA RAFAELA DOMINGOS DE LIMA

Recife
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Tese apresentada ao Programa de Pós-graduação em Ciência Política da Universidade Federal de Pernambuco, como um requisito parcial para obtenção do título de Doutora em Ciência Política. Área de concentração: Democracia e Instituições

Orientadora: Prof. Dra. Mariana Batista da Silva

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To Inaurenice, Elizabeth and Aurenice, Who built the path so I could walk.

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"Nunca estamos quietos / Somos trashumantes/
Somos padres, hijos, nietos y/ Bisnietos de inmigrantes." (Jorge Drexler, 2017 -
Movimiento)

ABSTRACT

To what extent do the effects of pork barrel policies in public policy spill over? Pork barrel greases the wheels of politics in many ways, being a crucial tool for building support in Congress and with the electorate. Due to their discretionary nature, they are considered an inefficient, poorly planned expense with a high possibility of generating corruption and creating clientelistic networks. Despite its lousy reputation, Pork barrel policies influence the electorate's daily life as they positively affect public policy in the target jurisdiction, even with small and dissipative effects. However, these effects could be underestimated as neither research considers the spatial relationship among municipalities. I argue that pork barrel collective effects are more prominent when considering spatial spillover effects, which permit them to reach neighbouring jurisdictions. Spatial interdependence among local units and the strategic allocation of pork monies draws this overflowing feature. The restriction on the amount of pork barrel policies available for distribution forces politicians to target units that can better absorb the demand of neighbouring areas and better process the benefit due to the accumulation of human and material resources. Consequently, spatial spillover effects increase the pork's beneficiary network, helping to soften its inefficiency and becoming politically efficient despite increasing subnational unevenness in policy provision. I use Brazil as a case to test this argument, as they have the proxy for pork barrelling, have good quality subnational-level data information available and provide 5,570 municipalities allowing the understanding of heterogeneous effects under the same institutional incentives and electoral features. To test this claim, I leverage the municipal level in an original time-series cross-sectional dataset, gathering data on 33,240 impositional budgetary amendments and health indicators for 5,214 municipalities between 2014 and 2018. I apply the Spatial Durbin Model that accounts for the interdependence among local units and verifies both the direct and indirect effects in target units and their neighbouring municipalities, respectively. The results show that legislators allocate pork barrel resources following a well-defined strategy: concentrating the highest share of pork barrel monies in a single municipality while benefiting its neighbours with lower values. Furthermore, suggest that pork barrel has a positive (albeit small) effect on health policy in the target municipality and neighbouring local units. Nonetheless, these effects are more prominent when analysing policy input indicators (measured as annual spending per capita) while losing their strength when analysed as policy process indicators, measured as BCG vaccine coverage, and outcome indicators, measured through the infant mortality rate. Taken together, these results contribute to understanding the effects of distributive policies on public policies at the subnational level and how the territorial dynamics can extend the network of beneficiaries and, ultimately, soothe the inefficiency of spending on the pork barrel policy.

Keywords: distributive politics; spatial spillover effects; pork barrel collective effects; multilevel dynamics.

RESUMO

Até que ponto os efeitos das políticas de *pork barrel* nas políticas públicas transbordam? As políticas de *pork barrel* lubrificam as engrenagens da política de várias maneiras, sendo uma ferramenta crucial para a construção de apoio no Congresso e junto ao eleitorado. Por seu caráter discricionário, são considerados uma despesa ineficiente, mal planejada e com grande possibilidade de gerar corrupção e criar redes clientelistas. Apesar de sua péssima reputação, as políticas de *pork barrel* influenciam o cotidiano do eleitorado, pois afetam positivamente as políticas públicas na jurisdição destinatária mesmo que com efeitos pequenos e dissipativos ao longo do tempo. No entanto, esses efeitos podem estar subestimados, pois nenhuma das pesquisas considera a relação espacial entre as unidades locais. Nessa tese, eu argumento que os efeitos coletivos do *pork barrel* são mais proeminentes quando se consideram os efeitos de transbordamento espacial, que permitem que alcancem jurisdições vizinhas. A interdependência espacial entre unidades locais e a alocação estratégica de dinheiro de *pork* desenham essa característica transbordante. A restrição da quantidade de *pork barrel* disponível para alocação obriga as representantes a direcioná-lo para unidades que possam melhor absorver a demanda das áreas vizinhas e processar o benefício devido ao acúmulo de recursos humanos e materiais. Consequentemente, os efeitos de transbordamento espacial aumentam a rede de beneficiários do *pork*, ajudando a suavizar sua ineficiência e tornando-o politicamente eficiente, apesar do aumentar a desigualdade subnacional na provisão de políticas. Eu uso o Brasil como caso para testar esse argumento, pois o país detém o *proxy* para *pork barrel* além de oferecer informações de boa qualidade a nível subnacional disponível publicamente e oferecer a um marco analítico com 5.570 municípios, permitindo a compreensão de efeitos heterogêneos sob os mesmos incentivos institucionais e características eleitorais. Para testar essa afirmação, construí um banco de dados transversal e de série temporal, onde reuni dados sobre 33.240 emendas orçamentárias impositivas e indicadores de saúde para 5.214 municípios entre 2014 e 2018. Na estratégia empírica, eu aplico o modelo *Spatial Durbin* que considera a interdependência entre as unidades locais e verifica os efeitos diretos e indiretos nas unidades-alvo e seus vizinhos, respectivamente. Os resultados mostram que as legisladoras alocam os recursos de *pork barrel* seguindo uma estratégia bem definida: concentrar a maior parcela do recurso em um único município enquanto beneficia seus vizinhos com valores menores. Além disso, sugerem que o *pork barrel* tem um efeito positivo (embora pequeno) na política de saúde tanto no município-alvo quanto nas unidades locais vizinhas. No entanto, esses efeitos são mais proeminentes quando analisados indicadores de insumos de políticas (medidos como gastos anual em saúde per capita) e perdem força quando analisados como indicadores de processos de políticas, medidos com a cobertura da vacina BCG, e indicadores de resultados, medidos por meio da taxa de mortalidade infantil. Juntos, esses resultados contribuem para compreender os efeitos das políticas distributivas sobre as políticas públicas subnacionais e como a dinâmica territorial pode ampliar a rede

de beneficiários e, em última instância, amenizar a ineficiência dos gastos das políticas de *pork barrel*.

Palavras-chave: política distributiva; efeitos de transbordamento espacial; efeitos coletivos das políticas de *pork barrel*; dinâmica multinível.

LIST OF FIGURES

Figure 1 – Tax by municipality	59
Figure 2 – Frequency and average amount of impositional budget amendments (2014-2018)	70
Figure 3 – Frequency and average value of pork barrel by type of recipient (2014-2018)	71
Figure 4 – Average value of dependence by state (2014-2018)	74
Figure 5 – Per capita value of impositional budgetary amendments received by municipalities (2014-2020)	79
Figure 6 – Per capita value of impositional budgetary amendments by State (2014-2020)	79
Figure 7 – Pork barrel as a percentage of population by state from 2014 to 2020	80
Figure 8 – Local indicators of spatial association clusters (2014-2018)	82
Figure 9 – Proportion of votes and pork-barrel delivered to municipality	98
Figure 10 – Pork barrel per capita distribution per year (2014-2018)	123
Figure 11 – Spending per capita distribution (2014-2018)	124
Figure 12 – BCG vaccine coverage distribution (2014-2018)	124
Figure 13 – Infant mortality rate per capita (2014-2018)	125
Figure 14 – Spending per capita distribution per year (2014-2018)	125
Figure 15 – BCG vaccine coverage distribution per year (2014-2018)	126
Figure 16 – Infant mortality rate per capita per year (2014-2018)	126
Figure 17 – Moran plot of pork barrel per capita (2014-2018)	127
Figure 18 – Weighted neighbour mean pork barrel per capita values (2014-2018)	128
Figure 19 – Density plot of global Moran I from Pork Barrel per capita (2014-2018) . .	129
Figure 20 – Quadrants	130
Figure 21 – Quadrants distribution	131
Figure 22 – Quadrants by region	132
Figure 23 – Quadrants by type of municipality	133
Figure 24 – Quadrants by population range	134

LIST OF TABLES

Table 1 – Pork barrel by city status (2014-2018)	72
Table 2 – Descriptive statistics of dependent variables (2014-2018)	74
Table 3 – Source: The author (2023)	74
Table 4 – Quadrants of LISA analysis	81
Table 5 – Spillover effects of pork barrel policies on health policy in Brazilian municipalities (2014-2018)	87
Table 6 – Direct and indirect impacts of spatial spillover effects	89
Table 7 – Pork barrel spatial spillover effects and high complexity health centres	91
Table 8 – Spatial spillover effects with high complexity health centre	93
Table 9 – Pork barrel spatial spillover effects under fiscal dependence	95
Table 10 – Impacts of spatial spillover under fiscal dependence	97
Table 11 – Pork barrel effects on health policy indexes (2014-2020): OLS models	136
Table 12 – Pork barrel effects on health policy indexes given the fiscal dependence (2014-2018): OLS models	137
Table 13 – Pork barrel effects on health policy indexes given the city status (2014-2018): OLS models	138
Table 14 – Ordinary least squares residuals for spatial correlation	139

SUMMARY

1	INTRODUCTION	16
2	THE POLITICS OF PORK AND ITS ROLE ON PUBLIC POLICY	19
2.1	The ultimate distributive policy	20
2.2	The ways and uses of pork-barrel: distributive politics worldwide	22
2.3	The politics of pork-barrel delivery	25
2.4	Where you live matters: space shaping local effect of pork on policy	29
3	THE BRIGHT SIDE OF PORK BARREL POLITICS	35
3.1	Let them eat bacon: the positive externalities of inefficient expenditure	36
3.2	Spatial dynamics helping to expand positive externalities	39
3.3	Legislative strategy behind spatial spillover effects	44
3.4	The political spine of spatial spillover effects	51
3.5	Where spillover matters most	54
3.6	When the externalities are not that good	55
3.7	Institutional framework: The Brazilian distributivism	57
4	DATA AND METHODS	64
4.1	When space matters: modelling pork barrel's spatial spillover effects	65
4.2	Scope condition: politically and fiscally decentralised countries	67
4.3	Data	68
4.3.1	Explanatory variables	69
4.3.2	Dependent variables	73
4.3.3	Control variables	75
5	RESULTS	77
5.1	Following the bacon: Pork barrel policies allocation in Brazilian municipalities	78
5.2	Porking around: Assessing pork barrel policies' spatial spillovers	85
5.3	Not every cloud has a silver lining: spillover effects and policy unevenness	97
6	CONCLUSION	100
	REFERENCES	104
	APPENDIX A - MAPS: DEPENDENT AND INDEPENDENT VARIABLES	123
	APPENDIX B - GLOBAL MORAN I	127

APPENDIX C - QUADRANTS DISTRIBUTION BY CATEGORY	130
APPENDIX D - OLS REGRESSION MODELS	135
APPENDIX E - OLS RESIDUALS FOR SPATIAL CORRELATION	139

1 Introduction

Pork barrel is a politically popular practice among politicians. Still, it has long been demonised by both public opinion and scholars due to its allegedly inefficient spending (SHEP-SLE; WEINGAST, 1981) that brings costs to all electorate despite only benefiting part of it (BARON, 1991) and its possible usage in the construction of clientelist and corruption nets (BARDHAN; MOOKHERJEE, 2000; SODRÉ; ALVES, 2010). However, this standard approach systematically ignores that a priori inefficient spending can produce efficient results, especially in the short term. At the local level, pork barrel helps finance the delivery of services and public policies (DIAZ-CAYEROS, 2008; TORRES; BASTOS; GAMA, ; BERTHOLINI; PEREIRA; RENNO, 2018), particularly in counties with low fiscal capacity (CHIAVEGATI, 2006; ALMEIDA, 2021), even though any effects encountered are small and dissipate over time.

Although any researcher should expect a small effect of pork-barrel policies on policy and welfare since this is not the ultimate goal but a positive externality of the policy, these findings could be underestimated as the scholarship ignores the spatial relationship among local units. Spatial proximity can deepen the understanding of so- sociopolitical phenomena by bringing to light dynamics that relate to spatial proximity and connect to a given country's political organisation (ANSELIN, 1995; ELHORST; VEGA, 2013; HARBERS; INGRAM, 2017; HARBERS; INGRAM, 2019; SALVATORE; RUGGERI, 2021). I develop my argument that this effect is broader than what the literature usually assumes, even among optimistic scholars, due to the spatial spillover effects that the concentrated nature of pork barrel generates. These overflowing effects directly result from the spatial interdependence among subnational unities and the allocation strategy chosen by congresspeople of distributive funds. Due to the scarce amount of money available to benefit the electorate, legislators benefit medium-sized cities that can absorb neighbouring jurisdictions' demand. This helps to diminish the inefficiency of the expense since more people have access to the benefit and allows the representative to negotiate political support on wholesale instead of retail. Consequently, it is politically efficient despite increasing subnational unevenness in policy provision.

Brazil is the ideal case for testing claims regarding the overflowing feature of pork barrel at the subnational level. Its three-layered federalism benefits the analysis as it provides a framework for working with more than 5,000 municipalities, allowing the understanding of heterogeneous effects under the same institutional incentives and electoral features (WAMPLER; SUGIYAMA; TOUCHTON, 2019; TOUCHTON et al., 2020). Additionally, the subnational

variation in political and fiscal aspects combined with the almost exclusive obligation to implement essential healthcare services and the natural proxy for pork-barrelling make the country a worthwhile case to analyse the local and territorial dynamics of pork-barrel effects. Also, the researcher can leverage its vast amount of publicly available data on budget, policy outcomes, and political and economic indexes.

To test this claim, I leverage municipal-level information on pork barrel and public policy indicators. Using Brazil as a case, I gathered data on 33,240 impositional budgetary amendments to operationalise the explanatory variable and health indicators for Brazilian municipalities for 5,214 municipalities as the dependent variable. The dataset comprehends the five budgetary years (2014-2018). Budgetary amendments per capita received by each Brazilian municipality in a given year are the independent variable and a proxy for pork monies. To operationalise the dependent variable, I break down health policy into three indicators: input, process and outcome (JANUZZI, 2001), measured as annual health spending per capita, BCG vaccine coverage and the infant mortality rate, respectively. Empirically, I undertake a spatial analysis of Moran I and local Moran I to identify legislators' allocation strategies for pork-barrel policies. Then, I apply nine regressions with the Spatial Durbin Model that accounts for the interdependence among local units and verifies both the direct and indirect effects on target units and their neighbouring municipalities, respectively.

The main findings indicate that legislators have at least four main allocation strategies that vary between the amount and the level of spatial concentration of the pork barrel resource. Among them, the primary strategy adopted seems to concentrate a larger share of pork barrel in some municipalities while dispersing smaller values among the units around that jurisdiction. This result suggests that, regardless of the reason why the legislator decides how to deliver pork barrel between the districts of the represented state, she concentrates a larger share in one municipality – which may indicate a focus on the generation of overflow. Furthermore, the Spatial Durbin Model results point out a positive (albeit small) effect of pork barrel monies on the indicators of public health policy. Nonetheless, breaking this effect into three public policy indicators seems to lose strength along the chain. The effects of pork barrel policies on public policy input indicators are the strongest. When we measure the same effect on the processor indicator, the effect is virtually non-existent, although it is small when we analyse it in terms of the result indicator. These results vary when we analyse the municipalities according to two characteristics: the existence of a highly complex hospital and fiscal dependence. In the first case, pork barrel monies do not seem to produce the expected effects on any of the indicators. In any case, the result seems to indicate that the highly complex variable captures some characteristics of the municipality that differ from its neighbours. Meanwhile, despite producing collective positive effects under fiscal dependence, pork barrel monies might not affect local political policies when measuring process and outcomes policy indications but matter in increasing input indicators.

This thesis is divided as follows. First, in the next chapter, I discuss the role of pork barrel policies in public policy. To do so, I first place pork barrelling as the ultimate distributive policy, and debate the usage of pork barrelling around the world and how its rotten reputation is conceived. I also present what scholarship has been teaching us through the years on how politicians in several democracies allocate it among their electorate. Finally, I discuss how space matters and why it benefits the understanding of pork barrel politics effects at the subnational level. In the third chapter, I develop the argument that sustains this thesis. To do so, I discuss the positive externalities of pork barrel monies and how they can produce collective positive externalities. Then, I develop reasoning on how space helps to expand the beneficiaries' networking of the policy effects of pork at the local level via the spatial spillover effects dynamics. I also discuss the congresspeople's strategy that drivers the pork allocation focusing on producing this overflow, followed by a discussion of which type of jurisdiction that features might matter most. Chapter four outlines the empirical strategy applied in this thesis, bringing the details on the spatial modelling adopted to test my claims. In the fifth chapter, I present the results of this thesis. In the last chapter, I bring forward the main conclusions, followed by references and the appendix.

2 The politics of pork and its role on public policy

Like the market, politics also deliver goods (STOKES; DUNNING; NAZARENO, 2014). These assets can be materialised in several different ways. Whether in the allocation of the federal budget to implement a conditional cash transfer policy, in the provision of a line of credit to beneficiaries or in the construction of a new hospital. These are public goods that the political system can create. However, this is not the only way that politicians have to produce goods. Distributive policies are another option for delivering goods to citizens. Pork barrelling is a common strategy, the ultimate distributive policy that concentrates the costs while desegregating the stakes (LOWI, 1964, p. 179).

Much criticism weighs heavily on pork barrel. Part of the literature classifies it as an inefficient use of the public budget (WEINGAST, 1979; LANCASTER; PATTERSON, 1990; BARON, 1991) while others are concerned with its possibility of constructing bridges to corruption and clientelism (BARDHAN; MOOKHERJEE, 2000; SODRÉ; ALVES, 2010). Despite that, pork barrel policies are a federal resource allocation tool. As intergovernmental transfers, it decentralises the federal budget to local units and acts as a multilevel financing mechanism for local governments. Relatable to discretionary fiscal transfers, distributive politics does not follow a specific allocation rule and ends up benefiting some units at the expense of others. In short, it decentralises funding but not to everyone.

Along with several other features, funding matters for policy-making at various levels of government. While local revenue and rule-based fiscal transfers are relatively constant in the local government budget, pork monies vary between and within local unities. Since this feature only affects certain locations (and is not guaranteed to continue), it can affect local performance, especially regarding policy provisions. That is why part of the scholarship has focused on the collective effects of pork barrelling. More specifically, they concentrated on understanding the effects of pork monies on local policy outcomes and social indicators. The results have found positive (Díaz-Cayeros; ESTÉVEZ; MAGALONI, 2016; TORRES; BASTOS; GAMA, ; ALMEIDA, 2021) although dissipative (BERTHOLINI; PEREIRA; RENNO, 2018) effects. However, these works might be underestimating pork's effects on local performance. Following a standard approach in political science (HARBERS; INGRAM, 2019; SALVATORE; RUGGERI, 2021), they do not consider essential spatial features of pork barrel politics and consider the spatial relations as constant between subnational units.

As several of the sociopolitical outcomes are clustered in space (Rodrigues-Silveira, 2019), and similar things tend to be closer to each other (TOBLER, 1970), spatial relations should be

considered in social research. Besides that, understanding units as independents can only provide a part of the causality story and hide some spatial processes (HARBERS; INGRAM, 2017). Spatial proximity connects units not only in geographic relationships but also in sociopolitical dynamics (ANSELIN, 1995), and research that does not take this into account is missing an essential part of the analysis. That is why in this chapter, I question how the consideration of spatial relations would shape pork barrelling effects on local performance in policy provision. More specifically, I ask if, when considering spatial dynamics in the relationship, to what extent pork barrel's effects would spill over to neighbouring units.

To support this inquiry, this chapter is divided as follows. First, I discuss the concept of distributive policies and place pork barrelling as the ultimate distributive policy, according to Lowi (1972) reasoning. Then, I talk the reader through the ways and usages of pork barrel politics in several democracies. Next, I discuss the delivery of pork monies among political actors while pointing out that it has an intrinsic territorial feature, regardless of the reason that triggers the allocation. Then, I debate how it can be understood as a resource that benefits subnational units in public service provision and why we should consider territory when analysing its effect on public policy.

2.1 The ultimate distributive policy

The yield of goods by representatives always draws attention (INÁCIO, 2011) because it shapes the type of goods created by the political system – whether public or private (BAGASHKA; CLARK, 2016). Politicians generally please the electorate in two ways: programmatic and non-programmatic. In the first one, the entire population (or a large amount of it) can receive the benefit that is not directly associated with electoral support or their geographical location – this usually happens in implementing public health, education or income redistribution policies, for example. On the other hand, non-programmatic distribution occurs contrarily, targeting specific locations and groups – and usually considering the possibility of exchanging benefits (either material or in terms of localised policies) for electoral support (GOLDEN; MIN, 2013; KRAMON; POSNER, 2013; RAILE; PEREIRA; POWER, 2011). Although both behaviours can coexist peacefully (KITSCHOLT, 2000), we must assume that political authorities generally have an intrinsic internal duality: making good government and securing political support. As they deal with the dual nature of their duty, political leaders are allocating resources (STOKES; DUNNING; NAZARENO, 2014). They are the same people who hold elective office and often draw strategies to gather political support for either reelection (WEINGAST, 1979) or votes for another office they aim for (SAMUELS, 2000).

Within this frame of reference, distributive politics is a valuable tool to help politicians achieve their electoral goals, and the strategies can be many. According to Lowi's (1964, 1972) typology, distributive politics is the arena that acts on individual conduct and with a remote level of coercion – that are targeted to specific locations and groups, also considered as Pork-

Barrel (KRAMON; POSNER, 2013; RAILE; PEREIRA; POWER, 2011; SPÁČ, 2016). There are several strategies of distributivism, and it is crucial to stress their differences.

Stokes, Dunning e Nazareno (2014) divide it into two main categories. Clientelism focuses on individuals and conditions the recipient of the benefit to vote – and encompasses vote buying (targeting voters) and patronage (targeting party members). On the other hand, pork barrel politics occurs when a geographically targeted allocation of federal funds benefits a specific group or location in the constituency (STOKES; DUNNING; NAZARENO, 2014, p. 7). Although all of them aim to generate concentrated benefits and diffuse costs (LOWI, 1964, p. 15) while gathering political support, the level of enforcement distinguishes them. Clientelism is the offering of material benefits conditional to responding to the "favour" with a vote or other types of support (STOKES; DUNNING; NAZARENO, 2014). Vote buying and patronage targets individually and can be charged by their compliance in the future. A typical example of vote buying in rural Brazil is the delivery of pressure cookers without the lid (which will be delivered to the voter after the election results)¹. Regarding patronage, obtaining the job position is conditioned to the candidate's victory in the elections – which generates a strong engagement of political nominees during the electoral campaign, for example. On the other side are pork-barrel politics, performed by legislators with access to public funding for investment (AMES, 1995) and less likely to be coerced as targets the collectivity rather than individually. In other words, clientelism is the distribution of tangible goods to specific individuals and, in this sense, encompasses the offer of public employment in exchange for support (AMES; BAKER; RENNO, 2008). On the other side are the pork-barrel policies that consist of programs that target collectivity rather than individuals (STOKES; DUNNING; NAZARENO, 2014). Both are related but distinct processes.

Pork-barrel exposes the symbiotic logic between both arenas. The electoral arena shapes legislative behaviour (BOWLER, 2000) as it takes place in an atomised universe with weakened parties and professional representatives seeking reelection (MAYHEW, 1974). The legislative arena provides inputs to electoral success, a function of policies delivered to her local constituency (LIMONGI, 1994). Then, the electoral connection sustains the legislative behaviour guided by a strong particularistic bias that directs activity to pursue the ultimate reelection goal (CAIN; FERREJOHN; FIORINA, 1987; FENNO, 1978).

This is how the pork barrel seems to be the quintessential distributive policy. First, it can take different forms, such as bills, approval of budget amendments (AMES; PEREIRA; RENNO, 2011) or projects of highway construction and some services funded by the government (LANCASTER; PATTERSON, 1990). Second, they are a set of particular decisions on allocating public goods and services to a specific part of society, involving taxes and transfers (GOLDEN; MIN, 2013). It can take the form of the submission of budget amendments for ambulance pur-

¹ "Compra de voto ainda é frequente no interior, dizem promotores e juízes". Available at <<https://g1.globo.com/Elcicoes2008/0,,MUL749895-15693,00-COMPRA+DE+VOTO+AINDA+E+FREQUENTE+NO+INTERIOR+DIZEM+PROMOTORES+E+JUIZES.html>>. Accessed September 12, 2022.

chases in Brazilian municipalities² or an investment agreement in railroad by the Spanish Central Government in Catalonia³. Lastly, distributive politics are so individualised and specific that when we try to disaggregate them, they may have little or nothing to do with each other or a general allocation rule (LOWI, 1964; LOWI, 1972) – and so is pork barrel.

Therefore, if the pork barrel is (i) a non-programmatic distribution, (ii) with a low possibility of coercion, (iii) where the targets are the collectivity (group or set of geographically delimited individuals) and (iv) whose receipt is aimed at gathering political support but not conditioned to it, it is clear that this is a perfect representation of distributive politics. In this sense, in the course of this thesis, I will use the term "pork-barrel politics" as a synonym for distributive politics and particularism – just as the literature of legislative studies has done over the years (LANCASTER, 1986; LANCASTER; PATTERSON, 1990; AMES, 1995; CATALINAC, 2018).

2.2 The ways and uses of pork-barrel: distributive politics worldwide

Pork barrel is a widespread practice among legislators in many democracies worldwide. Among politicians, it is considered an effective tool for achieving electoral goals. According to the Brazilian Legislative Survey – a project which has surveyed members of the Brazilian Congress for more than twenty years now – data, roughly 70% of Brazilian Congresspeople reported believing that pork barrelling is an essential tool for their electoral success⁴. Similarly, when Lancaster e Patterson (1990) surveyed the Bundestag members from 1983 to 1986, most German members of the National Congress believed that delivering projects to their districts helped with reelection.

Corroborating this idea of the pork barrel as one of the preferred strategies among politicians, examples of its usage abound in many contexts. In the United States, Congress launched a spending package with more than \$1,5 trillion to fund legislators' pet projects. Among them, a specific case stands out: Senator Richard C. Shelby has allocated at least \$500 million to his Alabama district⁵. Similarly, in 2021 then Prime Minister Boris Johnson launched a £3,6 billion "Town Fund"⁶ as part of a plan to level up the UK's regions. Nonetheless, the programme was disproportionally benefiting fellow conservative areas and was accused of being used as pork-barrel⁷. Pork barrel is also present in supranational institutions, as the 2009 European Commission case shows us. During the presidential term of José Manuel Barroso at the Com-

² "Saúde de Roraima recebe mais de R\$ 46 milhões em emendas de Telmário". Available at: <<https://folhabv.com.br/noticia/POLITICA/Roraima/Saude-de-Roraima-recebe-mais-de-R--46-milhoes-em-emendas-de-Telmario/88059>>. Accessed September 12, 2022.

³ "Cataluña recibe el 18,2% de la inversión territorial del Estado en 2019". Available at: <https://elpais.com/economia/2019/01/14/actualidad/1547465922_623337.html>. Accessed September 12, 2022.

⁴ See: <<http://bibliotecadigital.fgv.br/dspace/handle/10438/17569>>. Accessed 29, May 2022

⁵ "In the game of earmarks, Shelby has no peers". Available at: <<https://rollcall.com/2022/03/16/in-the-game-of-earmarks-shelby-has-no-peers/>>. Accessed Sep 6, 2022.

⁶ See: <<https://www.gov.uk/government/collections/towns-fund>>. Accessed Sep 6, 2022

⁷ "Boris Johnson pins election hope on 'levelling up' Britain — whatever that is". Available at: <<https://www.politico.eu/article/boris-johnson-uk-election-hopes-levelling-up/>>. Accessed Sep 6, 2022

mission, there was an attempt to raise the spending on the European Union Budget regarding energy and development – increasing it to €5 billion. This was seen as an opportunity to bring pork home by countries’ representatives, who were arranging projects that could benefit their own constituency⁸.

Politicians are generally seen as figures who must cherish the common good and deliver benefits to the population whenever possible – in a republican and, consequently, universalist way. This is the reason why, notwithstanding legal, pork barrelling has been demonised. Mainly, the electorate seems to worry about its potential to fund corruption practices and finance the construction of clientelist networks (SODRÉ; ALVES, 2010) due to its uneven delivery rule. Empirical evidence of this is brought as the result of a 2013 survey in the Philippines, which found that around 67% of those surveyed believed that pork-barrel monies are used inappropriately, and 45% said that it should be abolished⁹.

To be fair, it is not difficult to find examples of blurred allocation or actual mishandling of pork barrel worldwide. The Brazilian Secret Budget (*Orçamento Secreto*, in Portuguese) scandal is an example. Since 2020, the Speaker of the Lower Chamber, Arthur Lira, has been responsible for allocating around 7 billion Brazilian Reais from the Federal Budget to buy lawmakers’ support for Bolsonaro’s administration reforms and bills. The whole process happens very ingeniously: the budget amendments (the pork-barrel tools par excellence in the Brazilian budget (LIMONGI; FIGUEIREDO, 2005)) are negotiated in secret between the cabinet of the Speaker of the House and the individual legislators. Then, the resource is allocated through the exclusive rubric of the budget rapporteur to the previously negotiated locations. Still, there is no clue of who is the recipient of that funding so far¹⁰. Another example is the Philippines’ Priority Development Assistance Fund scam (PDA scam), which happened between 2007 and 2009. In this case, it is believed that almost 10 million Philippine pesos that should have been used for pork-barrel politics were pocketed by opaque non-governmental organizations that were linked to a businessperson accused of corruption¹¹. In the 2000s in Mexico, economic analysts were worried about the increase in 15% of pork-barrel spending near the election day¹².

But the demonising of pork-barrel politics is not exclusive to voters. Among scholars, there is also a branch that is not very sympathetic towards pork spending. (SHEPSLE; WEINGAST, 1981) argues that pork barrel politics are projects whose costs exceed their benefits but are acceptable given its political comeback – as long as it’s not "too inefficient" (SHEPSLE; WEINGAST, 1981, p. 107). Likewise, Baron (1991) argues that pork barrel spending brings public

⁸ "Lacklustre spring summitry", Available at: <<https://www.politico.eu/article/lacklustre-spring-summitry/>>. Accessed Sep 6, 2022.

⁹ "Pork barrel survey results loud and clear: Palace". Available at: <<https://news.abs-cbn.com/nation/10/15/13/pork-barrel-survey-results-loud-and-clear-palace>>. Accessed Sep 7, 2022.

¹⁰ "Brazil's Centrão: the political kingmakers propping up Bolsonaro". Access 17 ago 2022. Available at: <<https://www.ft.com/content/6d1d94f9-dabf-447e-b901-bcfe2c1bf73a>>

¹¹ "EXPLAINER: What you need to know about the PDAF scam". Access 17 ago 2022, available at: <<https://www.cnnphilippines.com/news/2021/2/14/PDAF-scam-what-you-need-to-know.html>>

¹² "Pork-Barrel Outlays in Mexico Spur Some Analysts' Worries". Available at: <<https://www.wsj.com/articles/SB96024325238346061>>. Access 15 May 2022.

costs while only benefitting part of the electorate and sometimes specific groups. Analysing the (PRI) allocation strategy for public investment in Mexico between 1990 and 1995, *Partido Revolucionario Institucional* equates pork barrel with regional opportunism. For the Brazilian budgetary amendments allocation, Sodré e Alves (2010) find a positive relationship between the receipt of pork-barrel monies by municipalities and an increase of 25% in corruption incidents at the local-level governments.

Despite this argument, the pork-barrel strategy has worked very well as "grease in the wheels" of politics (EVANS, 2004). In Spain, the government of Pedro Sánchez have allocated 32 million euros to the Basque Country for fund projects which included 6 million to fund a cultural project in Luzuriaga village, one million for a project to create a cycle track between the cities of Irurtzun and Ziordia and also several projects regarding infrastructures and highways railroads. This was a payment for the Euskal Herria Bildu (EH Bildu) support on the approval of the Federal Budget for 2021¹³. A similar situation happened in Australia, where observers noticed an uneven allocation of 2,8 billion dollars of grants. According to the information gathered, this amount of money was distributed between eleven projects of cabinet members, with the exclusive goal of increasing the chances of coalition cabinet members to be reelected¹⁴. Empirical evidence is also available in this sense. In the USA, Evans (1994) brings evidence that legislative leaders could use distributive benefits to construct coalitions in Congress. The operationalisation was easy: district projects would be used as currency to buy voters from additional legislators for specific bills and reforms. She analysed the impact of receiving district benefits on roll call voting between 1986 and 1987 in the House of Representatives and found that legislators who received projects were more inclined to comply with the preferences of the leader of the commission. Similarly, in Brazil, (LIMONGI; FIGUEIREDO, 2005) finds a similar strategy leading the relationship between the Executive and Legislative branches. In this specific case, the negotiation of individual budgetary amendments was the "missing link" that allowed the incorporation of both arenas: legislative and electoral.

In short, the essentially distributive feature of pork barrel policies leads to the perception that their allocation is inefficient. Either because it forged to gather support in the Congress (EVANS, 1994; EVANS, 2004; LIMONGI; FIGUEIREDO, 2005; AMES, 2003; VASSELAI; MIGNOZZETTI, 2014) or during elections (LANCASTER; PATTERSON, 1990; SAMUELS, 2002; BAPTISTA et al., 2012; SILVA, 2011). In short, the reasoning is that an expenditure that works as currency cannot generate other than corruption or clientelism (da Nóbrega, 2021; LINHARES; MARQUES, 2021). Despite this perspective finding some empirical evidence (SODRÉ; ALVES, 2010; FERRAZ; FINAN, 2011; FERRAZ, 2007), this scholarship avoids considering any possibility of pork barrelling not being harmful.

¹³ "El Congreso aprueba los Presupuestos: estas son las cesiones del Gobierno para poder sumar los apoyos suficientes". Available at: <https://www.ondacero.es/noticias/espana/congreso-aprueba-presupuestos-estas-son-cesiones-gobierno-poder-sumar-apoyos-suficientes_20211125619fa1389ef0da0001ec5240.html>. Accessed on June 29, 2022.

¹⁴ "How \$2.8 billion of your money is spent — it grossly favours Coalition seats". Available at <<https://www.smh.com.au/interactive/2021/electorates-government-grants/index.html>>. Accessed 16 May 2022.

If legislators were universalists and money were infinite, they would be able to allocate this resource evenly among the district units. But money is a finite resource, and Congresspeople are not angels. Furthermore, the pork allocation is one of the few moments they can make unilateral decisions regarding the federal fund target. So, they might follow a specific strategy to retain the most significant advantage of it, benefiting some locations at the expense of others (KRINER; REEVES, 2015; MESQUITA et al., 2014). In that sense, pork evolves the pure nature of distributive politics: as highly individualised decisions of allocating resources (LOWI, 1964; LOWI, 1972).

2.3 The politics of pork-barrel delivery

The allocation of pork-barrel monies is not random. The delivery of any good by Congresspeople is a product of their strategies to guarantee, build and maintain political support during the mandate (MAYHEW, 1974). Unlike other fiscal transfers, pork has no strict rule that delimits the decision-making process regarding where the money should go. On the contrary, it empowers the legislator to play a fundamental role in directing resources within the national territory. This discretionary feature of the pork barrel allows a local, uneven, and non-programmatic delivery. At this point, we find the "black box" on how legislators become points of distortion in allocating these resources. If legislators were universalists, they would allocate this resource evenly. But that is the moment when congresspeople can make a unilateral decision regarding the allocation of federal funds – they might follow a distributive logic to benefit some locations at the expense of others (KRINER; REEVES, 2015; MESQUITA et al., 2014). In that sense, pork evolves the pure nature of distributive politics: as a highly individualised decision of allocating resources (LOWI, 1964; LOWI, 1972).

Allocation drivers may also vary due to individual features that ensue differently for each congressperson. In that regard, under a set of institutional rules, individual legislative behaviour varies because it is constrained and stimulated by a diverse group of political processes (ZUCCO, 2009). However, such a difference may occur due to other processes such as political motivation (AMES, 1995; MAYHEW, 1974; VENTURA, 2021; SAMUELS, 2002), will to redistribute (BAIÃO; COUTO, 2017) or even non-political ties that connects the legislator to subnational unities (CAROZZI; REPETTO, 2019; MATTOS; POLITI; MORATA, 2020). Nonetheless, in this section, I discuss the scholarship findings to understand the "where" portion of this equation – trying to comprehend the reasons that might trigger the geographical distribution of pork monies. Building on the literature that explains the allocation of distributive benefits, we learn why there are reasons to expect pork-barrel allocation to happen in a concentrated pattern in the national territory.

Roughly speaking, the pork-barrel relationship goes as follows. During the federal budget decision period, congresspeople have access to a portion of the federal resource that can be assigned to subnational units with some allocation freedom. Generally, this delivery does not need to follow allocation rules. It works as a kind of "petty money" where the legislator supports

specific projects in a geographically delimited portion of her electorate. Local governments are at the destination point of this relationship, which receives and execute these resources enabling the electorate to benefit from them. Then, we can argue that legislators act on the supply-side while local governments and voters would be on the demand side. In this respect, the supply-side suffers significant incentives on their behaviour (ZUCCO, 2009) that effect does not occur evenly among the political class (POWER, 2000).

Considering the symbiotic dynamics between the legislative and electoral arena (MAYHEW, 1974; AMES, 1995; BOWLER, 2000), it is to be expected that electoral expectations affect the allocation of resources by the congressperson that wishes to be reelected or obtain another elected office (AMES, 2003; PEREIRA; RENNÓ, 2007; SAMUELS, 2002). This is how the electoral connection thesis will draw the incentives from the electoral arena affecting the decision-making process of congresspeople regarding federal funds allocation. In a situation where the two arenas influence one another, there is a massive encouragement to the legislator to concentrate benefits for a share of the electorate (MAYHEW, 1974; CAIN; FERREJOHN; FIORINA, 1987; FENNO, 1978). Putting it more straightforwardly, the lawmaker will please a share of her electorate with pork monies to build a reputation among her voters and to claim credit for it later in an attempt to boost her electoral support in a future election.

The electoral connection theorists conceptualised these incentives considering the North-American electoral system and the set of constraints it gives to their legislators. But building on the general concept provided from this strand, Ames (1995) rationalised the stimuli under an open-list proportional representation system, where legislators are highly personalistic and where there is high district magnitude with informal districts inside it. Using the Brazilian case as a basis for his theory, he argues that systems that create incentives for intraparty competition leads to particularism, as candidates seek survival by distributing pork barrel to their districts. He proposes that the geographical distribution of votes creates incentives for allocating goods in the legislative arena, encouraging the legislator under the aforementioned electoral system to act as the US congressperson (AMES, 1995; AMES, 2003). According to his typology, the geographical distribution of votes affects the delivery of goods – high levels of electoral concentration and dominance in some districts lead the congressperson to direct the constituency's attention to specific achievements (namely, the pork-barrel delivery) (AMES, 1995; AMES, 2003). In this case, even in contexts with high district magnitude, parliamentarians could build strong electoral bases and overcome the possibility that free-riders would use the credit generated by their activities – going against Lancaster (1986)'s argument.

While the electoral connection thesis is based on the idea that the personal vote is the electoral equilibrium strategy (NETO; SANTOS, 2003, p. 676), other aspects help to explain legislators' allocation of pork barrel politics. Also, considering the office-seeking behaviour, legislators can use delivery pork barrels to please local units where they aspire to a position in the local executive power (SAMUELS, 2000; MATTOS; POLITI; MORATA, 2020). A different set of arguments suggests that congresspeople target pork barrel to please subnational actors

but not voters. This line still considers the electoral arena stimulus on legislative behaviour, an understanding that political survival is a prominent trait of politicians. Still, instead of looking to the construction of reputation or electoral support from the electorate, the primary outcome would be campaign financing. In this argumentative line, pork would be targeted to jurisdictions where lawmakers identified more significant fundraising potential for their campaign. In other words, legislators deliver pork to raise donations from local businesspeople, not to please voters and gather electoral support (BOAS; HIDALGO; RICHARDSON, 2014; SAMUELS, 2002).

Partisan ties could also be a shortcut for deciding where to deliver the pork. Higher levels of government tend to favour co-partisans and punish opponents in lower levels of government with distributive politics (DENEMARK, 2000; MCCARTY, 2000; BERRY; BURDEN; HOWELL, 2010; KRINER; REEVES, 2015; BAERLOCHER; SCHNEIDER, 2021). Notably, congresspeople will send pork monies to jurisdictions where rulers are politically aligned with her (SORRIBAS-NAVARRO, 2011; MOSCOVICH; BRUSCO, 2018; HANRETTY, 2021; HENRIQUE; BATISTA, 2021) or punish them by not sending pork that they can benefit from (BROLLO; NANNICINI, 2012; BUENO, 2018). But, they are not only patiently waiting for the benefit that might arrive from legislators. State governors participate in the existing dynamic in the National Congress through collective or individual action strategies (OLMEDA, 2009; GERVASONI; NAZARENO, 2017). On the other hand, local mayors are also active demanding agents. They are the ones with the prerogative of implementing public policy, services and goods. Without them, targeted resource allocation by legislators may not bear much return. This should take place as teamwork: while the legislator allocates distributive politics, the local administrator acts like her broker, being the arm distributing the goods (AUYERO; BENZECRY, 2017; BAIÃO; COUTO, 2017; ROCHA; GELAPE, 2022). Although non-political ties also unite representatives and their brokers (ROCHA; GELAPE, 2022), a classic form of recruiting local government is by sending pork barrels to their jurisdictions (VENTURA, 2021). They can either help or hinder the congressperson from constructing a network that allows her to claim credit for benefits in the future.

Mayors often request the resource directly from the Federal Government (MEIRELES, 2019). In Brazil, for example, Mayors travel to Brasília to claim to legislators for distributive politics for pork barrel to speed up specific projects^{15 16 17}. They also often participate in complementary training willing to learn how to request and use pork barrel monies that groups

¹⁵ “Prefeito Vanderlei Markus vai a Brasília em busca de liberação de recursos”. Available at: <<https://paverama.rs.gov.br/noticia/visualizar/id/1218/?prefeito-vanderlei-markus-vai-a-brasil-ia-em-busca-de-liberacao-de-recursos.html>>. Accessed Nov, 16th 2022.

¹⁶ “EM BRASÍLIA: Bruno participa de reunião com a bancada federal da Paraíba e defende recursos para saúde e economia de Campina Grande, além da duplicação da BR230”. Available at: <<https://campinagrande.pb.gov.br/em-brasil-ia-bruno-participa-de-reuniao-com-a-bancada-federal-da-paraiba-e-defende-recursos-para-saude-e-economia-de-campina-grande-alem-da-duplicacao-da-br-230/>> Accessed Nov, 16th 2022.

¹⁷ “Prefeitos da Amensp fazem reunião em Brasília para lutar por emendas federais”. Available at: <<https://www.andradina.sp.gov.br/portal/noticias/0/3/2832/prefeitos-da-amensp-fazem-reuniao-em-brasil-ia-para-lutar-por-emendas-federais>>. Accessed Nov, 16th 2022.

and associations of cities host^{18 19}. This specific demand means everything for the local financial reality since the receipt of pork monies allows for funding public policy, goods and services (BUENO, 2018) that were not forecast in the previous budget. Additionally, it helps to implement local demands such as the construction of hospitals, health centres and execution or expansion of the municipal sewage network (CHIAVEGATI, 2006). Mayors also have electoral aspirations. Some evidence shows that they cultivate relationships with congresspeople to receive infrastructure and public works projects investment and claim credit for it later – since it is viewed as a sign of good administration (GOLDMAN; PALMEIRA, 1996; BEZERRA, 1999; ROCHA; GELAPE, 2022). Then, in addition to the reasons that benefit the citizens of their district, they can demand pork-barrel aiming at their effects in voting and demand pork monies to deal with competitive elections (FERRAZ, 2007; FERRAZ; FINAN, 2011).

However, in addition to what was previously discussed, the scholarship on distributive politics also suggests that other features could affect the decision-making process on assigning these funds other than political reasons. Non-political ties can also shape political behaviour and influence allocation. For example, there is empirical evidence showing that legislators concentrate discretionary resources on the cities where they were born. Although there is no consensus on the actual strategy the legislator uses to do so, the fact is that congresspeople can aim to concentrate the delivery of federal money to their birth town. Scholars suggest that it could be either due to personal connections in their hometown (CAROZZI; REPETTO, 2019) or because they want to benefit this specific constituency projecting to claim credit in a future electoral run for local office - targeting the construction of a career in the local executive power after the end of the legislative career (MATTOS; POLITI; MORATA, 2020).

Meanwhile, considering the institutional incentives in multinomial districts (where more than one representative can claim credit for local projects), the threat of the free-riding problem is real. Due to the lack of acknowledgement of the legislative production by the electorate and the difficulty of correctly attributing the generation of the particularised benefit, the possibility of rightly rewards decreases (ASHWORTH; MESQUITA, 2006; LANCASTER, 1986). If this logic is correct, the ability to claim credit is a function of the election in which the incumbent is running, whether with too many or too few seats. Thus, in a single country, the allocation incentive varies according to the district's magnitude that the legislator candidate for reelection will face. Also, the electoral cycle can influence the distribution of budget resources over time since we can expect more significant commitment to the allocation of resources on the basis of budgets in election years.

All the incentives I have discussed in this section seem to point out one pattern of pork allocation: the concentration in one or a few jurisdictions. Either motivation on the supply and demand side indicates that congresspeople have reasons to deliver pork concentrated – to generate

¹⁸ “CNM e Instituto Paulo Ziulkoski anunciam cursos para julho Municípios”. Available at: <<https://ama-al.com.br/cnm-e-instituto-paulo-ziulkoski-anunciam-cursos-para-julho/>> Accessed Nov, 16th 2022.

¹⁹ “Curso gratuito trata sobre gestão da saúde nos municípios”. Available at: <<https://appm.org.br/noticia/curso-gratuito-trata-sobre-gestao-da-saude-nos-municipios>> Acesses Nov, 16th 2022.

reelection, redistribution, campaign financing or benefit their hometown. Legislators are a point of distortion in allocating the federal resources assigned to them. They target local jurisdictions in a concentrated, non-random and non-programmatic way. But, in short, the scholarship has focused on who gets the short-term with decisions that can be taken "without regard to limited resources" (LOWI, 1964, p. 180), but little do we know about *where* these benefits go.

2.4 Where you live matters: space shaping local effect of pork on policy

The provision of public goods and services varies across countries. Different nations have distinct average levels of electricity supply, illiteracy rate, access to sewage treatment, and enrolment rate, for example. The explanations for such differences are countless and can range from social, economic, political, and administrative aspects. In Political Science, these disparities have been analysed under specific lenses and attributed to features such as the type of fiscal federalism implemented in each country or the structure and tradition of the state (Rodrigues-Silveira, 2019). But this is not an insulated phenomenon. These variations also occur within countries, where several other factors vary significantly across the national territory, including population density, gender, ethnic composition, and immigration (VOSS, 2007). Such variation is not exclusive from the Global South (GONZÁLEZ; NAZARENO, 2022) as the cross-country comparisons would bias us to think. On the contrary, when scaling down the analysis, we can observe such disparities in wealthier countries as well (Otero-Bahamón, 2021).

The subnational politics scholarship has identified that public goods and services are also unevenly distributed within countries (GIRAUDY; LUNA, 2017; GIRAUDY; MONCADA; SNYDER, 2019; GIRAUDY; PRIBBLE, 2020; HARBERS et al., 2021). In other words, public service provision varies among subnational units. The noteworthy consequence of this finding is that the simple fact of living in a jurisdiction defines the type of good or policy the citizen has access to. In sum, some citizens benefit from better public policies than others within the same national territory. The reach of states varies within the national territory. The levels of social provision differ even in countries where the welfare system is considered universal (Otero-Bahamon, 2019). However, this scholarship's findings dissonates with the concepts of State applied in Political Science, which often relates to homogeneity and ignores the possibility of variation. The capable states are the ones that can penetrate the territory to reach different social groups (MANN, 1984); can implement policies that benefit most of its citizens (BESLEY; PERSSON, 2011) or even generating similar results in policies (WEAVER; ROCKMAN, 1993). Considering this picture, the possibility of having different levels of reach in its territory is ignored, and federations would be less capable as they flirt directly with heterogeneity as they conceive and intend to deal with socioeconomic, cultural and ethnic disparities among subnational units (LIJPHART et al., 2003). Consequently, where this is true, there will be an inequality in the level of citizenship experienced by people (O'DONNELL, 1999).

There is a plethora of illustrations for this case. In Colombia, some children have access to good-quality health programs. At the same time, in the other corner of the country, groups

usurp the system – differentiating the access depending on the region where they were born (EATON, 2006). Similarly, some Brazilian municipalities where the Mayors have implemented participatory budgeting experienced lower levels of infant mortality when compared to others that haven't (TOUCHTON et al., 2020). Another example of the stark variation is in the findings of Giraudy e Luna (2017). While analysing the electricity distribution in 147 countries, they identified the uneven electricity allocation within countries. These differences were more prevalent within the countries of Latin America and the African continent. Regarding the protection of women's political rights, Cleary (2020) finds out that there is a considerable variation among the municipalities of the Mexican state of Oaxaca (CLEARY, 2020). Meanwhile, in Brazilian municipalities, the social security benefits are delivered unevenly within the national territory and fail to benefit areas with the most demand (Rodrigues-Silveira, 2019). Diametrically opposed to what the concepts of State teach us, not even the most vital State can put into practice all sorts of policies and implement them perfectly (ROGERS; WELLER, 2014). In the real world, different demands should shape the policy provision (Rodrigues-Silveira, 2019), and those place-sensitive policies would benefit the provision in marginal and rural areas (Otero-Bahamón, 2020).

Subnational variation occurs when geographic location and service delivered are correlated and is conceptualised as the disparities in the quality of service that differentiate subnational jurisdictions (GIRAUDY; PRIBBLE, 2020, p. 26). While not precisely a red light signalling danger, gaps in social provision can signal different dynamics. It could be regarding any priority, available resource level, bureaucracy skills, municipal vulnerability or even enforcement of existing laws and legal institutions (ENRIQUEZ; SYBBLIS; CENTENO, 2017). In Argentina and Brazil, the state capacity, history of previously implemented policies, and political alignment with the president and state governor seem to matter for the quality of policy implementation (NIEDZWIECKI, 2018). To understand differences among subnational municipalities, the quality of bureaucracy working in the jurisdiction also matters as cities with better bureaucrats have fewer failures in policy implementation and a lower number of irregularities in the usage of federal transfers (BATISTA, 2015). In the municipalities of the Mexican state of Oaxaca, the type of management matters as ethnic communities governed by traditional assemblies could provide public services more efficiently compared to those governed by political parties (MAGALONI; Díaz-Cayeros; EULER, 2019). Similarly, Chilean municipalities with an experienced mayor (holding more than three terms) seem to experience more substantial institutional capacity and better policy provision (PRIBBLE, 2015). In Brazil, states' higher electoral competition for the running of governor leads to an increase in the provision of primary healthcare (ALVES, 2015).

But the devil is in the details. There is another crucial feature that matters for the reach of the state at the subnational level. The action of local governments is a function of state resources and state capacity (WAMPLER; SUGIYAMA; TOUCHTON, 2019). A better (BATISTA, 2018), and careerist (LEWIS, 2007) bureaucracy leads to better policy implementation at the local

level. However, the level of funding available for investing in public services also matters for its quality. And this also varies subnationally. Some jurisdictions have more funding than others. In practice, this difference allows the delivery of different levels of services and public policies in different jurisdictions under the same fiscal, institutional and political arrangement. This does not only happen in developing countries. On the contrary, countries with bureaucratic and administrative capacities can suffer from the same disease (STEINBERG, 2018; HARBERS; STEELE, 2020). Within the same nation, the level of revenue varies among subnational units. Some localities are more skilful in taxing and generating local public revenue (SHAH, 2006; ARRETCHÉ, 2002). Some localities may benefit from a distortion in the rule that generates a greater flow of federal funds through constitutional transfers, even when rule-based (DEDA; KAUCHAKJE, 2019). On the other hand, some jurisdictions may be better able to apply for decentralised federal resources than others (MEIRELES, 2019).

This is when pork barrelling takes the stage in the debate, as it directly involves allocating public goods and services to a specific portion of the electorate (GOLDEN; MIN, 2013). For not following a type of rule and being at the mercy of the legislator's actions as a point of distortion, pork-barrel policies are delivered non-randomly to jurisdictions within a district. Regardless of the reason that triggers the targeting on the part of the congressional member, pork monies are transfers that benefit some localities over others. It can give some advantages to implementing public policy and providing social services. More specifically, let's consider a situation where three municipalities receive the extra allowance provided by pork-barrel money within a district. In those places, the funds can be used to improve or implement policies that weren't foreseen in the budget before, improving access for its citizens. At the same time, the other seven jurisdictions in the same district will not have access to such a resource. They will not be able to implement it to improve the performance of policies or programs at the local executive level. Consequently, there will be a difference in access to local goods produced by local governments in the same district: citizens from the three benefited jurisdictions might access better policy provisions. In comparison, those who live in the other seven jurisdictions don't.

If politics is about "who receives what, when and how" (LASWELL, 1936), the concern about the reach of the State adds to the spatial dimension of subnational variation in the supply and provision of public goods and services — transforming the argument into "who receives what, when, how, and where" (LOBÃO; BOOKS; TICKAMYER, 2007). In this sense, the issue revolves around understanding which subnational units hold the necessary assets to assess policy at the local level. When some municipalities receive extra funding, such as pork barrel politics it is important to understand to what extent it affects the lives of citizens, especially regarding local policies, mainly when we consider that its effect can occur in a non-homogeneous way in the territory. While pork monies have little importance for jurisdictions that can generate their own revenue, they should play a significant role for the ones with budget constraints. Precisely for these locations, pork appears as space for manoeuvre to implement policies not

foreseen in the initial budget of local management (BUENO, 2018). Thus, in the context of solid budget constraints, pork barrelling gains much more importance – as receiving an extra amount of money makes it possible to meet essential demands from the electorate, including the policy implementation and the construction of works that improve the population's welfare (CHIAVEGATI, 2006).

Therefore, space matters to understand the variation of funding in public policies at the local level. And some research has focused on demonstrating the positive effect of pork-barrel policies on public policy indicators and social welfare indices at the local level (Diaz-Cayeros; ESTÉVEZ; MAGALONI, 2016; ARVATE; MATTOS; ROCHA, 2015; TORRES; BASTOS; GAMA, ; ALMEIDA, 2021). However, any effects encountered are small and dissipate over time (BERTHOLINI; PEREIRA; RENNO, 2018). Although any researcher should expect a small effect of pork-barrel policies on social outcomes since this is not the ultimate goal but a positive externality of the policy, all these findings may be underestimating the pork barrel results due to a common aspect: they do not consider the spatial dynamics between subnational units when they should.

Since pork barrel money is a variable fund targeting geographically delimited units, the space is crucial to discussing its effects at the subnational level. As several of the sociopolitical outcomes are clustered in space (Rodrigues-Silveira, 2019), understanding units as independents can only provide access to part of the causality story and hide some spatial processes (HARBERS; INGRAM, 2017). Spatial proximity can deepen the understanding of sociopolitical phenomena by bringing to light dynamics that relate to spatial proximity and connect to a given country's political organisation. The diffusion literature demonstrates perfectly that spatial proximity enables a process that matters for the outcome analysed (SUGIYAMA, 2008; SUGIYAMA, 2012; COÊLHO; CAVALCANTE; TURGEON, 2016; BATISTA, 2018). Thus, administrations are not islands. On the contrary, they influence each other through various mechanisms.

Spatial proximity connects units not only in geographic relationships but also in sociopolitical dynamics (ANSELIN, 1995), and research that does not take this into account is missing an essential part of the analysis. Ignoring the spatial relationship in theory building and hypothesis writing has been fairly standard in political science. Despite this, ignoring the importance of spatial relationships and considering that units are always independent of other units can be detrimental to empirical research, leading to biased results (HARBERS; INGRAM, 2019; SALVATORE; RUGGERI, 2021). This is especially true when dealing with such a territorial-based subject as pork barrel. This may be the hidden fact that diminishes the effect of pork barrel policies on policy at the subnational level. By ignoring spatial dynamics, existing work tells only part of the causal story.

To fully understand the local effects of pork barrel politics in subnational policy provision, we have to dig deeper. This calls to consider the spatial relationship between local units when analysing sociopolitical issues (HARBERS; INGRAM, 2017). More specifically, to acknowl-

edge that local unities are not independent (OSTROM; TIEBOUT; WARREN, 1961; OSTROM; OSTROM, 1977). The spatial proximity between the local units enables the movement of citizens that creates a separate dynamic between the cities, mainly the metropolitan centres, where some units concentrate on material and human resources and offer certain services (whether public or private). In México City, 19 districts concentrate about 53% of the jobs²⁰. This is also true regarding services, as the number of services provided correlates with the city's size (PUBLISHING, 2015, p. 5). And often, cities offer services both to themselves and the surrounding areas (DALLHAMMER et al., 2019). To illustrate, it is common to see Brazilian citizens commuting from their hometowns to use hospitals from bigger cities²¹ or bringing kids from the rural areas to school in bigger cities²². This story repeats itself in many democracies around the world.

In this way, at the subnational level, there is a movement of human capital between the units that, in addition to bringing information (FERRARESI; MIGALI; RIZZO, 2018), leads to strategic interactions between subnational governments (ANSELIN, 1995; BAICKER, 2005; CAPELLO, 2009; ELHORST; VEGA, 2013). Just as the results of such information affect local governance in terms of public policy provision, considering that things closer are more related than those that are further away (TOBLER, 1970, p. 236) and that geographical proximity generates spatial dynamics and processes among local units (ELHORST; VEGA, 2013; LÓPEZ; MARTÍNEZ-ORTIZ; CEGARRA-NAVARRO, 2017; SALVATORE; RUGGERI, 2021; VINCENT; KWADWO, 2022) – it is reasonable to think to what extent such processes affect public policy at the subnational level. Bringing this discussion to an object whose direction is essentially geographic and which affects the results of public policies at the subnational level is how I intend to contribute to this work.

An essential part of understanding the extent of citizenship is identifying the distribution of supply and public goods and services related to social development and why (Otero-Bahamon, 2019). This is why rationalising the effect of pork barrel on these outcomes is crucial for both developing theories and addressing real work problems since it is a controversial public fund. Although having a non-programmatic and uneven nature of pork (STOKES; DUNNING; NAZARENO, 2014), pork barrel can generate positive effects on welfare indexes (BERTHOLINI; PEREIRA; RENNO, 2018; ALSTON et al., 2006) and provide resources to localities where it might be unavailable (AMES; PEREIRA; RENNO, 2011). In other words, a priori inefficient spending can generate efficient results, especially in the short term. But more than that, space matters for policy (Otero-Bahamón, 2020), and local outcomes are related to each other (OSTROM; TIEBOUT; WARREN, 1961; TOBLER, 1970). Spatial proximity en-

²⁰ "Mexico City's Endless Commute". Available at: <<https://www.bloomberg.com/news/articles/2017-02-09/mexico-city-s-endless-commute>>. Accessed Jan, 31st 2023.

²¹ "Limeirenses em tratamento de câncer em Barretos passam a contar com Casa de Apoio". Available at: <<https://diariodotransporte.com.br/2023/01/27/sao-jose-dos-pinhais-pr-recebe-mais-um-onibus-para-transporte-escolar/>>. Accessed Jan, 31st 2023.

²² "São José dos Pinhais recebe novo ônibus para transporte escolar". Available at: <<https://diariodotransporte.com.br/2023/01/27/sao-jose-dos-pinhais-pr-recebe-mais-um-onibus-para-transporte-escolar/>>. Accessed Jan, 31st 2023.

courages commuters' movement and can underlay political processes between local units. Then I inquire, when considering spatial dynamics in the relationship, to To what extent would the pork barrel's effects spill over to neighbouring units?

3 The bright side of pork barrel politics

Pork barreling works like "grease on the wheels of politics" (EVANS, 2004) in many ways. Although considered a crucial political tool for gathering and maintaining support in the National Congress (FIGUEIREDO; LIMONG, 1999; LIMONGI; FIGUEIREDO, 2005; PEREIRA; MUELLER, 2003; PEREIRA; RENNÓ, 2007; EVANS, 2004; ALSTON et al., 2006) and for elections (COX; MCCUBBINS, 1986; DIXIT; LONDREGAN, 1995; AMES, 2003; BANFUL, 2011; FRIED, 2012; SPÁČ, 2020), it seems to draw attention to its lousy reputation. Pork is generally considered an inefficient, poorly planned (SHEPSLE; WEINGAST, 1981; BARON, 1991) expense with a high possibility of generating corruption and creating clientelistic networks (BARDHAN; MOOKHERJEE, 2000; SODRÉ; ALVES, 2010). This literature systematically ignores that a priori inefficient spending can produce efficient results, especially in the short term. Pork barrel helps finance the delivery of services and public policies (AMES; PEREIRA; RENNO, 2011; CUSTER et al., 2016; BERTHOLINI; PEREIRA; RENNO, 2018), particularly in counties with low fiscal capacity (CHIAVEGATI, 2006; ALMEIDA, 2021).

In this chapter, I develop my argument that this effect is broader than what the literature usually assumes, even among optimistic scholars, due to the spatial spillover effects that the concentrated nature of pork barrel politics generates. These overflowing effects directly result from the spatial interdependence among subnational unities and the allocation strategy chosen by congresspeople of distributive funds. Due to the scarce amount of money available to benefit the electorate, legislators benefit medium-sized cities that can absorb neighbouring jurisdictions' demand. This helps to diminish the inefficiency of the expense since more people have access to the benefit and allows the representative to negotiate political support on wholesale instead of retail. Consequently, it is politically efficient despite increasing subnational unevenness in policy provision.

To disentangle this reasoning, I first examine how the scholarship finds that pork monies can positively affect the electorate's lives by discussing empirical evidence of pork monies on policy outcomes and welfare indexes. Then I qualify how the potential spatial spillover effects can occur, bringing the spatial dynamics of pork barrel politics to the centre of the stage and discussing the role of spatial interdependence in this matter. Later, I argue that politicians do not make that by chance but use a power calculus on the electoral and political advantages of these spillover effects. Following, I discuss the role of brokers in the local electoral connection that enables the allocation and spillover effects to be politically effective. I then discuss where the effects matter most, discussing the heterogeneous effects on municipalities with greater fiscal

dependence and lower revenue collection capacity, and I conclude by rationalizing the negative externalities that pork-barrel policies can raise for neighbouring jurisdictions.

3.1 Let them eat bacon: the positive externalities of inefficient expenditure

Like roll call voting, speeches and debates, pork barrel politics are one of the foundations of representatives' daily life in several National Congresses. The dynamics are well-known and implemented by politicians worldwide. Nonetheless, pork barrel is the one legislative activity with a sour reputation. The main point of its rejections lies in its nature. It is an expense that is locally targeted and delivered without coordination (LOWI, 1964; LOWI, 1972; STOKES; DUNNING; NAZARENO, 2014). This does not put pork barrelling in a prestigious place. Scholars will often accuse it of being inefficient spend (LANCASTER; PATTERSON, 1990; BARON, 1991) because they are not economically justified expenses and the costs exceed the expected benefits (WEINGAST, 1979, p. 8) or to increase corruption and help to build clientelistic bridges (BARDHAN; MOOKHERJEE, 2000; SODRÉ; ALVES, 2010) since it allows the allocation of funds to 'phantom' institutions only to enable Congress members to extract rent from public budget (JUCÁ; MELO; RENNÓ, 2016, p. 7). But pork funds are not precisely guilty of these charges. On the contrary, one can build on evidence to argue a case to soften these accusations and allege that pork barrelling can also generate positive externalities.

Targeted funds are not necessarily converted into corruption, as the delivery of private benefits by politicians in office is sometimes part of the job, even if it transgresses democratic ideals (ROSE-ACKERMAN, 2008) – such as universalism. In addition, other types of benefits are not locally directed and can also lead to corruption. A programmatic policy can also lead to corruption, mainly when implemented at the local level (NEUDORFER; NEUDORFER, 2015). The power gained by local administration can lead to corruption due to its implementation strategy and the street-level bureaucracy behaviour (GOFEN; MEZA; CHIQUES, 2022) and also lead to bribery, or extortion (ASTHANA, 2012; NIEUWBEERTA; GEEST; SIEGERS, 2003). Also, local officials can use the allocation of rule-based policies to corrupt, as suggested by evidence found in the drinking water sector in two Indian states (ASTHANA, 2008), with the rule-based fiscal transfers in Russia (TREISMAN, 1996), and the allocation of public funds for roads and education in Romania (IONIȚĂ, 2005).

There is another side to this coin. One of the main reasons for understanding pork barrel funds as a counterproductive expenditure is their distributive nature. Conditional cash transfer policies collect taxes from all citizens and apply them to the neediest part of the population to fight inequality and reduce the transmission of poverty between generations (LOMELÍ, 2008), applying a redistribution logic (LOWI, 1964). There is systematic evidence that such policies positively affect individual, household income and employment rates (SKOUFIAS, 2001; SKOUFIAS; MARO, 2008; Hoces de la Guardia; HOJMAN; LARRAÑAGA, 2011; STAMPINI; TORNAROLLI, 2012). Still, also education (BUDELMEYER; SKOUFIAS, 2004; GARCÍA; SAAVEDRA, 2017) and health (GERTLER, 2004; KING et al., 2009) outcomes, in addition to

also increasing gender equity (MOLYNEUX; THOMSON, 2011; AMBLER; BRAUW, 2017). A similar situation happens with rule-based transfers, which show positive effects on schooling and literacy rate (LITSCHIG; MORRISON, 2013; CRUZ; ROCHA, 2018; AVEZANI, 2014), the gross domestic product of local units (CORBI; PAPAIOANNOU; SURICO, 2014), subnational spending (AVEZANI, 2014) and on the average education of political candidates (BROLLO et al., 2013).

But this is not exclusive to programmatic policies. Despite being a non-programmatic resource delivered uncoordinatedly (LOWI, 1964; LOWI, 1972), researchers have also identified positive externalities of pork barrel spending at the subnational level. Compared to the scholarship that analysed the impact of programmatic politics, the bright face of pork monies has been much less addressed (AMES; PEREIRA; RENNO, 2011; BERTHOLINI; PEREIRA; RENNO, 2018). However, there is empirical evidence showing that receiving pork barrel monies increase public policy outcome indicators and welfare indicators at the local level. In Spain, Sorribas-Navarro (2011) analyses the allocation of discretionary transfers to the regional government between 1986 and 2006 and identifies that the Central Government uses it as a tool to bailout regions – that were greater when they were responsible for health care provision and where the political support for the ruling party was more minor. Similarly, Moncarz et al. (2017) analysed Argentinean intergovernmental transfers from 1983 to 2005 and identified that poorer provinces that received discretionary grants have benefited from the allocation of manufacturing production, with an even more significant effect when politically aligned with the ruling party at the Federal level.

The findings of Roberson (2008) challenge the idea of pork inefficiency when suggesting that policies politically targeted increase the competition between parties leading to better efficiency of local provision. In México, Diaz-Cayeros, Estévez e Magaloni (2016) analysis the strategies for the fight against poverty and the effects of both formula-based transfers and the *Pronasol*, a project to decentralise federal funds to the subnational level that was widely used by the then ruling party *Partido Revolucionário Institucional* (PRI) as a pork-barrel policy. Their results suggest that formula-based transfers are more effective in improving public goods coverage compared to *Pronasol*. However, the pork-barrel policy generated some positive (albeit very small) effects on the index proposed by the authors. Brazil, which has in the individual budget amendments of congressional members a pork-barrel tool par excellence, appears in some analyses that try to identify the collective effects of this resource - going beyond the allocation patterns and electoral effects generally analyzed in the literature. Arvate, Mattos e Rocha (2015) analyzes the effects of unconditional cash transfers and identifies that these transfers positively affect health and education outcomes. These effects, although smaller than conditional transfers, reinforce the evidence of flypaper effects since an additional dollar increase in local public spending has a greater effect than the corresponding value on the increase in local income. Likewise, Torres, Bastos e Gama () analyse the pork-barrel allocation and its effects on health

outcomes in Brazilian municipalities. Using longitudinal data, the results suggest that budget amendments reduce regional inequalities and increase health indicators at the subnational level.

On the other hand, Almeida (2021) uses formal models to fight the "myth of inefficiency" of pork-barrel monies. To do so, he uses the Brazilian framework with pork-barrel politics per excellence from the individual budgetary amendments from members of Parliament. He identifies that given the level of uncertainty and information asymmetry, allocating resources through pork barrel policies generates higher levels of social well-being. In other words, pork barrel's positive effect on the delivery of well-being at the subnational level in the country. Complementary evidence suggests the positive effect of this resource on municipal public services and welfare outcomes: Bertholini, Pereira e Renno (2018) find a positive effect of budget amendments on human development indicators at the municipal level. Specifically, receiving budget amendments for one year shows a decrease of about 13% in the average infant mortality rate. In contrast, municipalities that received pork barrel policies for two consecutive years experienced a decrease of 7% in the same index compared to the municipalities that did not receive the resource. Although positive, this effect is dissipative and does not last much longer than two years.

Rationalising the recipient of this resource in a context of budget constraints where there are horizontal gaps in terms of the possibility of generating local revenue. Then, any resource would mean an awful lot for delivering service. Some can argue that pork barrel has little marginal effect in localities where there is no budget restriction and are more equal. Still, it appears to have a fundamental role for those poorer, less productive, and more unequal places (ORTEGA; PENFOLD-BECERRA, 2008; ROBINSON; VERDIER, 2003). In a case like this, any receipt of public resources can help implement programs and, considering the flypaper effect, matters for the municipality's social spending level. At the end of the day, with pork barrel some mayors will have an extra allowance added up to their budget and others don't – that extra revenue could generate collective effects by helping to implement projects and policies that were not previously foreseen in the local budget (CHIAVEGATI, 2006). In this situation, pork barrel could enable policy implementation at the local level (BUENO, 2018). In the same direction, scholars have provided some evidence that pork barrel might help decrease regional inequality (Carvalho, 2007) and increase the levels of the welfare state (BERTHOLINI; PEREIRA; RENNO, 2018).

Taken together, these pieces of evidence suggest that even uncoordinated and discretionally allocated spending can generate positive externalities, especially when considering a context of fiscal disparity. However, it does not assert that pork is all about collective effects. Pork monies can be used for non-republican reasons. Scandals such as the Budget Dwarves¹ and PDAF Scam² do not let me lie. The embezzlement of pork barrel monies can also occur (FERRAZ,

¹ "Rádio Câmara - Especial das CPI: CPI do orçamento". Available at <<https://www.camara.leg.br/radio/programas/258256-especial-das-cpis-cpi-do-orcamento-07-09/>>. Accessed on September 28, 2022

² "EXPLAINER: What do you need to know about the PDAF Scam". Available at <<https://www.cnnphilippines.com/news/2021/2/14/PDAF-scam-what-you-need-to-know.html>>. Accessed on September 28, 2022

2007; FERRAZ; FINAN, 2011). While allocative inefficiency only relates to the lack of coordination of federal spending, pork misappropriation relates to corruption – where public resource money is used for private/individual advantage. Although both can overlap, they are not symbiotically related. Because corruption prevents the positive externality of spending – as someone else than the electorate is receiving this money – and its inefficiency ex-ante allocation does not preclude positive collective effects ex-post. The previously discussed set of these findings completes the conventional wisdom by highlighting how a distributive fund can produce positive collective effects – even if its effect is cumulative (given the proportion of other transfers) and with a short life. In other words, spending seen as inefficient can yield locally efficient results in citizens' lives, even if only in the short term.

3.2 Spatial dynamics helping to expand positive externalities

Like any policy that arrives at the subnational level from a national framework, pork barrel politics are not "place-neutral" and always have spatial implications (Otero-Bahamón, 2020; BARCA; MCCANN; RODRÍGUEZ-POSE, 2012; GARCILAZO; MARTINS; TOMPSON, 2010). We already know that empirical evidence suggests that funds from pork barrel policies positively affect public policies and welfare indicators (SORRIBAS-NAVARRO, 2011; BERTHOLINI; PEREIRA; RENNO, 2018; Diaz-Cayeros; ESTÉVEZ; MAGALONI, 2016). However, these results may be underestimated because the scholarship on pork's effects has ignored its geographical aspect. While detrimental to the analysis, this is not a rare move in the discipline of Political Science as a whole. On the contrary, this approach mimics the usual behaviour in the discipline, where scholars rarely consider the spatial relationship between the observed units and treat it as a nuisance (JR; HAYS, 2008; SALVATORE; RUGGERI, 2021). Nevertheless, concerning the case of the pork barrel's positive externalities, I plead that overlooking the spatial aspects is a critical error and leads to an underestimation of its effects as these dynamics allow the expansion of externalities to more citizens.

Pork barrel politics are intrinsically spatial. The space feature is always present in several of its aspects. Conceptually, it is a grant that targets part of the constituency delimited geographically (MAYHEW, 1974; STOKES; DUNNING; NAZARENO, 2014). From an allocation point of view, due to the scarce pork money, legislators target some municipalities at the expense of others (MESQUITA et al., 2014). Also, the location is the main trait that defines its feasibility of exclusion (OSTROM; OSTROM, 1977). More specifically, geographical boundaries define which administration has access to pork monies as the grant is sent to one jurisdiction, district or city, excluding others. In this sense, we can consider pork barrel as a local public good whose consumption should be limited to the constituency living inside jurisdictions borders (OATES, 2005, p. 352).

Public goods are those to which all citizens have access. Where there is no possibility of exclusion, refereeing to the situation when all potential users are allowed to utilise the good without needing to meet any specific criteria designed by the supplier (OLSON; FERNANDEZ,

1999). Also, when there is a complete situation of jointness of consumption, meaning that the use of the good by one person will not prevent others from enjoying it (OSTROM; OSTROM, 1977). For example, you can forbid someone from entering your house or eating your piece of cake. But you cannot prohibit a person from enjoying the freshness of the ocean's breeze when at the seaside of a country or deny access to enjoying less polluted air because those are public goods. Regarding public goods the State provides, another concept adds up to this definition: packageability, meaning the perfect restriction of access to a good for those who reside and pay taxes inside the geographical boundaries of a jurisdiction (OSTROM; TIEBOUT; WARREN, 1961). For example, the Brazilian State of Pernambuco has created a leading project of full-time technical schools for high school students that only children living in the state can get access to since it is necessary to provide proof of residence in the enrollment process³. So, a public good is perfectly internalised by the State when it is packaged and can exclude non-contributors (OSTROM; TIEBOUT; WARREN, 1961).

These attributes seem to work perfectly when dealing with market goods. But when it comes to analysing public goods provided by the State, it seems to face some challenges. The situation is tricky: the feasibility of exclusion is controlled by the supplier in market goods, nonexistent in the public goods and halfway in local public goods. The latter issue is the most intriguing. When public goods are provided locally by municipalities in Brazil, counties in the United Kingdom or districts in Peru, they are public to anyone inside the jurisdiction boundary but exclude those outside it from benefiting. The division of public works in a municipality is an example of a local public good that provides road maintenance and waste collection in a given city (SEO, 2017). Another example is the Social Assistance Reference Centres (CRAS, in Portuguese) in Brazil, which are coordinated by the municipal administration and whose access is limited based on where you live. If you live in the city of Olinda, you will access one CRAs and in the city of Recife, a completely different one.

But excluding non-residents and non-taxpayer can be costly or impossible, especially if we consider subnational units and their local governments are only partially independent from each other (OSTROM; TIEBOUT; WARREN, 1961). If we look at real life, it is very unlikely that we can think of a situation where administrations are entirely independent of each other. The diffusion literature demonstrates this perfectly at national (SUGIYAMA, 2011) and sub-national (SUGIYAMA, 2008; SUGIYAMA, 2012; COÊLHO; CAVALCANTE; TURGEON, 2016; BATISTA, 2018) levels. Administrations are not islands. On the contrary, they influence each other through various mechanisms, whether learning, competition, emulation or coercion (BERRY; BERRY, 2018). But to comprehend the porosity of barriers to accessing local public goods, it is critical to consider geographical proximity. But also the role played by spatial dynamics. The literature has long documented that local jurisdictions are organised in a poly-

³ "Há mais de 20 mil vagas para alunos novatos em escolas estaduais integrais de Pernambuco. Matrícula já pode ser feita". Available at: <<https://jc.ne10.uol.com.br/colunas/enem-e-educacao/2022/11/15126747-ha-mais-de-20-mil-vagas-para-alunos-novatos-em-escolas-estaduais-integrais-de-pernambuco-matricula-ja-pode-ser-feita.html>>. December 13, 2022.

centric manner. Basically, it is a group of decision-making centres that are formally independent but somehow influence each other due to spatial proximity (OSTROM; TIEBOUT; WARREN, 1961, p. 831). By way of explanation, jurisdictions cannot help that some are near each other. Even if each government acts entirely independently, some mechanisms allow the government actions to influence surrounding local units' decision-making process. This goes back to the classic idea that things closer together are more related (TOBLER, 1970).

In the polycentric pattern discussed by Ostrom, Tiebout e Warren (1961), the cities are organised so that there is a central city. Interactions in metropolitan areas distinguish cities more or less naturally. Some cities provide an agglomeration economy due to returns in the scale of production, goods and services and consequently develop skills and specialisation in human activities (IHLANFELDT, 1995; SCHALTEGGER; ZEMP, 2003). That one will end up defining itself as the role of the central city (IHLANFELDT, 1995). The immediate consequence of that is the increase in the wealth of the central city, which will affect living costs in the whole area and incentive people to move to surround communes (SCHALTEGGER; ZEMP, 2003). Yet, the concentration of economic forces creates a bubble of opportunities that force people to commute daily between cities during the week (PIZZOL et al., 2021; PIERONI et al., 2021), mainly for work-related matters (RODRIGUES et al., 2021).

When the commuter's stream is constant, governments are collective consumption units, and goods are scarce (OSTROM; OSTROM, 1977), there is no way out other than the exchange between subnational governments. Along with this movement, information moves from the central to neighbouring cities, allowing the flow of information and learning on how to manage and implement public services and policies (BAICKER, 2005; SOLÉ-OLLÉ, 2006). More than that, the central city will face an increase in demand for public service due to the movement of commuters but will not experience an increase in tax-related revenue (SCHALTEGGER; ZEMP, 2003). Since many people come to the central city for work-related reasons or to access private services only found there, some services will start to feel pressure. As transport and urban cleaning, for example.

But this is not the only problem. The supply and demand of public services also have a dynamic that interacts with the spatial nature of polycentric systems. On the one hand, factors such as population density, gender, ethnic composition, and migration are unevenly distributed within national territories (VOSS, 2007). As the type of urbanisation varies across the country, the density, percentage of the labour market, and level of industrialisation also vary and shape the demand for policy and local public goods in several ways (Rodrigues-Silveira, 2013b, p.16). Such socioeconomic and demographic aspects are considered place-based and affect the demand for public services (Otero-Bahamón, 2020), making it change according to the location of the searched national territory.

The state's reach does not happen uniformly (GIRAUDY; MONCADA; SNYDER, 2019). Instead, the provision of public goods and services will occur through a quasi-market logic – delivering public goods and services where users are demanding (OSTROM; TIEBOUT; WAR-

REN, 1961). In short, the State will not follow a geographic dispersion pattern, where each region or city council within a state would have its health centre or pediatric clinic. Instead, while some essential services will be available in most small jurisdictions, more complex services will be offered where there is greater demand. Additionally, it is inefficient for every municipality to have a reference hospital, for example. Because the costs would outweigh the benefits, given the reduced demand. In this way, service provision through the quasi-market logic is the most suitable, as it concentrates the offer where there is greater demand for that service – even if it creates a movement of commuters from neighbouring jurisdictions in search of that specific type of service. Its consequence is uneven access to local public goods depending on the location. In the same district, some regions will have different policy demands from their neighbours. In a polycentric system, if someone lives in the central city, she will have more accessible public services than someone living in the neighbouring areas.

Thanks to the interdependence of jurisdictions and the flow of information on the type of provision and quality, voters can compare and decide whether they prefer to remain in their jurisdiction or "vote with their feet", moving somewhere that better matches their tax and service provision preferences (TIEBOUT, 1956; OSTROM, 1990; SCHALTEGGER; ZEMP, 2003). Jurisdictions tend to concentrate demand and provision of an extensive range of local public goods and services (OLIVEIRA; CARVALHO; TRAVASSOS, 2004). As a consequence, jurisdictions would compete for tax-payers, and they could find themselves in a Nash-equilibrium situation leading to a contest where they would pressure each other to decrease the provision of public goods and services, creating an actual "race to the bottom" (BRUECKNER, 2000; ERMINI; SANTOLINI, 2010). In other words, one jurisdiction would become the centre of this political system and provide a wide range of public services and local public goods.

Due to the concentration of expertise in the central city, which generates a differentiated provision of local public services, the local government might find it challenging to prevent non-residents from using their local public goods and services. In this sense, access to some local public goods is not dichotomous. Barriers of state, municipality or district may not be as effective. People who do not pay taxes in a jurisdiction can access its advantages, generating a kind of externality. Then, the central city can find itself in a situation of benefit spillover (OSTROM; TIEBOUT; WARREN, 1961). The most classic way of thinking about spillovers is to consider the renovation of a public road: even when only one state invests resources in its improvement, residents of other states will be able to use the roadway (CASE; ROSEN; JR, 1993, p.288). Concerning local public goods, spillover effects occur when citizens of localities close to the central city (generally those who commute daily) notice that they have unrestricted access to goods and services by the jurisdiction that acts as a perfect substitute for the ones provided by their home local unit (SOLÉ-OLLÉ, 2006). They choose to act rationally in this situation and enjoy the benefits without paying the costs, engaging in free-riding behaviour (OSTROM; OSTROM, 1977) towards the services and goods that have not been perfectly internalised (OSTROM; TIEBOUT; WARREN, 1961).

In other words, the endeavour to exclude contributors from accessing collective benefits can be challenging (OSTROM, 2003, p. 241). Then, in practice, those barriers become surmountable. Bigger and highly populated local unities could not be bothered to downgrade their level of policy provision because the spillover from smaller neighbour cities is too little to be felt by the residents of a bigger city (FERRARESI; MIGALI; RIZZO, 2018). But the opposite is not valid. Often, neighbouring city residents commute to central cities to access services with a level of complexity that is not found in their jurisdictions. This is in line with the idea of providing services through a quasi-market logic (OSTROM; TIEBOUT; WARREN, 1961). In a situation like this, any provision has two effects: direct, which influences the jurisdiction and its residents, and indirect, which affects its neighbours. And this reassures us that place matters for the production of public goods (Tiebout, 1972), policy outcomes (Otero-Bahamón, 2020) and also pork's spatial feature.

With the pork barrel, we have a scenario of some subnational unities with extra resources landing while others do not. A greater flow of resources can lead to differences in the type of local service and goods the jurisdiction provides – even if this resource is discretionary. As receiving it positively affects policy (BERTHOLINI; PEREIRA; RENNO, 2018), the target jurisdictions can go the extra mile in providing public service compared to the ones not receiving it. In other words, the type of service someone access is will vary according to the city, autonomous communities or states in which she resides (GIRAUDY; PRIBBLE, 2020; HARBERS; STEELE, 2020). If a person lives in a district where the representative is keener to please the electorate with pork barrel, she might get better access to sewage and health centres. Considering the quasi-market logic of policy provision and the spatial interdependence (OSTROM; OSTROM, 1977), residents of neighbouring jurisdictions can choose to engage in free-ride behaviour and commute to access public service – generally provided by the central jurisdiction of the polycentric system. Then, we can also expect to see spatial spillover effects.

Decisions of a local unit influence the choice of neighbouring units, generating either positive or negative externalities (CONLEY; DIX, 1999; SOLÉ-OLLÉ, 2006; ERMINI; SANTOLINI, 2010; SIANO; D'UVA, 2017). In addition to this geographical influence, having the local governments acting as the decision-making centre brings closer public agents, voters, and political elites (CEPAL, 2005; BOSSUYT, 2013) what entitles better attribution of credit and blame due to the smaller size of the constituency and the more effective information flow (Fan et al., 2009). More recently, evidence shows how one local unit's decision-making process can influence its neighbours' decision-making: spillover effects (BRUECKNER, 2003; CONLEY; DIX, 1999). How much a subnational unit spends in policy influences how much its surrounding units will spend themselves. It happens through the spillover, where commuters engage in free-riding behaviour and benefit from local public goods promoted by local units where they do not reside or through competing jurisdictions due to information flow and judgement of their local government performance (yardstick competition model) (BESLEY; CASE, 1992; HAYASHI; YAMAMOTO, 2017).

Consequently, the positive effects obtained through the pork grant are not locked up in the benefited jurisdiction but overflow into their neighbouring jurisdictions (ANDRÉS-ROSALES et al., 2021). Then, neighbouring cities benefit from the service offered by the town targeted by the pork leading to spillover effects. This generates a direct positive consequence in terms of provision: the scope of spending is greater since a more extensive network of beneficiaries accesses pork's collective effects. In other words, by benefiting from the provision of the jurisdiction that receives the most significant flow of resources (namely, the recipient of pork barrel), commuters can raise the policy outcomes and welfare indexes of neighbouring cities, even if they keep their public services provisional level constant. This spatial spillover effect consequently enhances pork barrel positive externalities, allowing more citizens to take advantage of it.

3.3 Legislative strategy behind spatial spillover effects

But these spillovers do not happen by chance. On the contrary, legislators will carefully decide where to invest pork monies considering strategies to enhance its potential consequences on provision and elections. In the former, to ensure that the most considerable amount of voters can access its positive collective externalities, and the latter to enhance its political returns by claiming credit for befitting more people in the district. The way to guarantee this is by creating a strategy to aim locations that can process the resource received, overflowing it to nearby units and increasing the capacity for building political capital for the legislator.

Although pork barrelling is a very common practice in several democracies around the world, the resources available for it are scarce. In North Carolina, the discretionary fund, which can be considered pork barrel politics, encompasses only about 0,25% of the State budget in 1985's State legislative (THOMPSON, 1986). The intergovernmental transfers considered pork barrel grants delivered from National Congress to Italian municipalities between 1994 and 2006 reached only about 0,8% of the total GDP. The individual budget amendments act as institutionalised pork barrel policies in Brazil. Each year, members of congress can amend the federal budget up to 25 times, respecting the limit of 1.2% of the net current revenue foreseen in the project forwarded by the Executive Branch. In 2023 each one of the 70 Senators and 513 Federal Deputies will have R\$ 19,704,897.00 to benefit their electorate⁴.

Despite controversy among public opinion and scholars, pork barrelling does not cage a significant share of public funds. As exemplified, the total amount represents a small proportion of the budget. Individually, this is an even smaller share available to support local projects and please voters. The practical consequence of this restriction on pork resources is that congress-people will face the challenge of strategic allocation to make it an efficient tool in pursuing their electoral goals. This isn't easy in any situation. But, it has an aggravating factor when it comes

⁴ For more information, please see the "Manual of Amendments to the Federal Budget for 2023 (PLN 32/2022)". Available at: <https://www.camara.leg.br/internet/comissao/index/mista/orca/orcamento/or2023/emendas/Manual_Emendas.pdf>. Accessed on Dec 15, 2022.

to multi-member districts, where legislators are at risk of free-rider problems (LANCASTER, 1986) as they are not the only representative trying to convince the electorate to be politically supported. Another candidate may attempt to claim credit for the good delivered to the jurisdiction. It becomes even more complicated when dealing with a multi-member district with large proportions or many informal districts. The legislator will have little pork money to split between many jurisdictions or voters. (MESQUITA et al., 2014).

Since politicians cannot satisfy everyone by delivering pork barrel monies. They will need to adopt a strategy that increases the returns of these funds. The intriguing part of this equation is that jurisdictions are not equal. Pork monies find a different reality in each place it arrives and also generates different outcomes. However, those attributes may be helpful for the legislator to create her strategy for using the pork barrel. We already know that politicians react to incentives and create strategies to spend resources better invested in both public services and visible goods – like structural projects (ACOSTA; MENESES, 2019), and as pork-barrel policies are mainly directed towards visible projects (SAMUELS, 2002) and created positive externalities in policy even if in the short-term (BERTHOLINI; PEREIRA; RENNO, 2018), so we can use the same reasoning for them. In that regard, legislators will be careful about the proportion of pork monies allocated in each jurisdiction due to its scarcity. It is strategic for the legislator that the largest number of potential voters have access to the resource she sends. This way, she can gain the empathy of the electorate and cultivate a larger share of the electorate. In this sense, it is reasonable to consider that she will target a specific type of jurisdiction. So, she will target localities with the most remarkable capacity to process the pork-barrel resource and have the potential to overflow those benefits to the greatest number of voters.

We notice stark differences when comparing the types of jurisdiction aimed by the distributive policy. Although large cities and state capitals can perfectly transform pork barrel monies into policies that benefit the population, such cities would not be the primary objective of legislators. In municipalities where a large number of goods are being delivered, perhaps the pork-barrel resource is not highly valued by the population because it has a lower value. These localities tend to be the more developed, with a more remarkable ability to tax and generate their own revenue and, consequently, less dependency on fiscal transfers and usually an extensive range of public services provided. In such a situation, pork monies' marginal effects are less critical – because they are not vital resources for these locations. Also, state capitals and metropolitan centres have a shared electorate (AMES, 1995; AMES, 2003), a large number of well-voted candidates where no one has electoral dominance reduces the possibility of claiming credit for the improvements.

On the other hand, in poorer, less productive and unequal places, pork monies appear to have a fundamental role in helping provide goods and services (ORTEGA; PENFOLD-BECERRA, 2008; ROBINSON; VERDIER, 2003). Smaller jurisdictions often have less capacity to generate funds and depend more on intergovernmental fiscal transfers from the Central government (MELO, 1996; ARRETCHE, 2012; VEIGA; VEIGA, 2013). While pork barrel is a welcome

fund in this context, mainly because of its positive effects on policy and welfare (Diaz-Cayeros; ESTÉVEZ; MAGALONI, 2016; TORRES; BASTOS; GAMA, ; BERTHOLINI; PEREIRA; RENNO, 2018), locations in this group are unlikely to receive the most pork. Such localities are likely to lack the human and material resources necessary to properly process pork resources (Firjan, 2016) in a politically efficient way for benefactor legislators. In other words, while pork is essential, these jurisdictions will not have the power to make pork-barrel policies as visible as the legislator needs.

In this sense, legislators will preferably allocate pork barrel grants to medium-sized jurisdictions that are "hub locations" of a polycentric system. These areas have the necessary attributes to enable the overflow of the effects of pork policies on welfare indicators and the implementation of public policies. First, they are units in a position of centrality in the polycentric system. Generally, they have an agglomeration economy and deliver reasonable policies for the population (SCHALTEGGER; ZEMP, 2003). Second, they are places with expertise centres that neighbouring jurisdictions do not have the necessary demand to receive. In this sense, they are locations that act as a centre in the quasi-market logic in the provision of public policies, in addition to forging the existence of commuters (SCHALTEGGER; ZEMP, 2003) – that is, people who migrate from time to time to use services that are not available in their localities. This allows the indirect effect of pork-barrel positive externalities: spillover to surrounding areas by affecting commuters. Finally, although they are not district capitals, these units generally have the amount of human and material resources to undertake services that deal with the pressure of their population and commuters – as they are the primary reference in several policy services in the polycentric system cluster (PUBLISHING, 2015).

The expected consequence of targeting mid-size locations is an increase in the network of beneficiaries of the collective positive externalities of the pork barrel through the spillover of these benefits. This is possible for two reasons. First, First, the movement of occasional commuters accessing local public goods in the jurisdiction targeted by the pork-barrel policies allowed for the overflow of collective effects. Second, there is a territorial concentration in public service provision (LUNA; SOIFER, 2017; Otero-Bahamon, 2019; GIRAUDY; PRIBBLE, 2020), which can be corroborated by the existence of clusters of delivery of goods and services in specific areas (OLIVEIRA et al., 2021). An example is Oliveira, Carvalho e Travassos (2004) which has identified the territorial concentration concerning access to the high complexity hospital care network: few centres provide this type of care, and about half of the municipalities are disconnected from that network. Therefore, the concentration of pork barrel resources in medium-sized jurisdictions that serve as the main supply point for the surrounding "satellite locations" enhances access to the collective effects of distributive policy since it increases the number of citizens who access this type of service directly benefited by the delivery of benefit by the legislator. In short, politicians will leverage the scope of pork spending by targeting mi-sized jurisdictions that act as hub locations in the polycentric system to allow the spillover.

But in addition to focusing on the spillover of the service population from pork policies, politicians are also interested in the electoral consequences of spillover. I imagine the reader must be tired of reading the same thing in several pieces of research on distributive politics. However, I ask permission to invoke (LASWELL, 1936)'s famous statement once again – because this is a "who gets what, when, how" situation all over again. But now, spicing it up with some "where" feature (LOBÃO; BOOKS; TICKAMYER, 2007). Having the local government as the decision-making centre brings public agents, voters, and political elites closer (CEPAL, 2005; BOSSUYT, 2013). Such proximity allows for better attribution of both credit and blame due to the smaller size of the constituency and the more effective information flow (Fan et al., 2009). And legislators will take advantage of this aspect to ensure their electoral objectives are achieved. After all, despite positive externalities, pork barrel is a natural electoral strategy that seeks to benefit a locality in search of its vote.

A politician's primary goal is to hold office. Then, she will either build strategies to be re-elected (WEINGAST, 1979) or try to get political capital to run for executive office at the local level (SAMUELS, 2000). Legislators are aware of the power of using pork barrel politics for electoral success (INÁCIO, 2011; AMES; PEREIRA; RENNO, 2011; LEMOS; RICCI, 2011). Similarly, the scholarship points out the potential for electoral returns that this practice can produce (MAYHEW, 1974; FENNO, 1978; CAIN; FEREJOHN; FIORINA, 1987) to the ones who can claim credit for it (BICKERS et al., 2007). Despite the fact that some weak negative (SAMUELS, 2002; LAGO; ROTA, 2014; FIRPO; PONCZEK; SANFELICE, 2015) results, there is a tremendous amount of evidence suggesting that voters recompense politicians who benefit them by targeting discretionary federal funds (GOLDEN; MIN, 2013). At the individual level of candidacy, it can help to gather political support when seeking reelection (COX; MCCUBBINS, 1986; DIXIT; LONDREGAN, 1995; AMES, 2003; BANFUL, 2011; FRIED, 2012; SPÁČ, 2020), running for a local executive office (MATTOS; POLITI; MORATA, 2020) or even convincing the local elite to finance their campaigns (SAMUELS, 2002; BOAS; HIDALGO; RICHARDSON, 2014; KLINGENSMITH, 2015).

Recent findings show that non-partisan programmatic policies will likely generate electoral returns (LITSCHIG, 2008; LITSCHIG; MORRISON, 2013; JR, 2013; BRAUW et al., 2015; IMAI; KING; RIVERA, 2020). Despite that, the accumulated evidence for discretionary spending is noteworthy (GOLDEN; MIN, 2013, p. 84). Most studies on pork-barrel policies and their electoral effects have been disproportionately concentrated in the United States (LANCASTER; PATTERSON, 1990). Mainly because the distributive explanation found in the United States the most efficient way, so far known, of applying the mechanism that legislators seeking re-election need to please the voter to guarantee votes: the commissions (LIMONGI, 1994), this seemed to be the most favourable place for pork-barrelling since they reduced transaction costs in the plenary vote market (CARVALHO, 2003). In the North American House of Representatives, the pork-barrel policy appears worthwhile in creating electoral returns as an increase in \$100

per capita of discretionary spending returns about 2% of the popular vote within the district (LEVITT; JR, 1997).

Later, we learnt that this effect is not uniform across countries (STRATMANN; BAUR, 2002) or political systems (BICKERS; STEIN, 1996), appears to be greater in places with the single-member district (LANCASTER, 1986) and often disproportionately benefits subnational units for non-political reasons, such as ethnicity (KRAMON; POSNER, 2013; NEMČOK et al., 2021). The positive results in building electoral support in various contexts, countries and empirical strategies. In Mexico, during the elections between 1990 and 1995, pork-barrel policies improved the electoral support for the central government party, the PRI – which was responsible for allocation (FONT; RODRIGUEZ-OREGGIA; LUNAPLA, 2003). Even term-limited legislators engage in pork-barrel politics, specifically through amendments to the federal budget, to increase their political capital. According to the Kerevel (2015) findings, they suggest that Mexican legislators use the pork strategy to build their electoral base for the following offices he may run for.

In Slovakia, when Spáč (2020) analysed 7,355 competitive elections over twelve years (2006-2018), the findings suggested that the central government increased the amount of discretionary spending in the district during the election year, the incumbent mayor increased her share of votes – and pork monies sent by the end of mayoral term only enhanced electoral advantage in small towns. Veiga e Veiga (2013) analysed parliamentary elections from 1974 to 2008 covering 288 Portuguese municipalities to understand the relationship between the increase of pork-barrel monies and the effects on vote share. To do so, they operationalised pork as intergovernmental fiscal transfers. They applied a simultaneous equations model and find out that increasing the level of transfers targeting municipalities in the election year enhances 0,44 per cent of electoral support. In rural China, Luo et al. (2010) leverages survey data from 2,450 villages randomly selected between the years 1998 and 2004 to identify the effects of a local office being elected and implementing projects regarding public policies while in office enhances its chances to be reflected, suggesting that the electoral connection version of rural China encompass the local elections and investment. Similarly, in Argentina, the allocation of discretionary in-kind and cash transfers to the Federal Government disproportionately targets subnational units politically aligned with the governing party. This disproportionate resource flow makes it possible for the Argentinian ruling party to increase the electoral support of their peers at subnational elections (RUMI, 2014).

The Brazilian political system has features that incentives legislators to establish personalistic linkages towards the electorate and transform (MAINWARING, 1991; SHUGART; VALDINI; SUOMINEN, 2005). Research on legislative particularism has burst when there is a conjunction of open-list proportional representation with large districts. In the country, the production of discussion about legislative particularism and personal vote has always been associated with pork-barrel (BAIÃO; COUTO, 2017, p. 716) and the pork allocation through budgetary amendments is even called the "Brazilian electoral connection" (LIMONGI; FIGUEIREDO,

2005). Regarding its electoral returns, Barry Ames (1995, 2003) will argue that Brazilian municipalities act as informal districts, and every deputy who delivers pork monies to a municipality or group of municipalities within the electoral district, managing to claim credit for it, will increase his chances of re-election. While analysing 615 Federal Deputies that ran for reelection in 1998, where about 65% of them were successful, Pereira e Rennó (2001) found out that only the ones who got pork-barrel monies approved and executed at the local level had their vote share increased. In other words, voters only voted for those who actually delivered pork monies, not just those who promised. Similarly, (PEREIRA; MUELLER, 2003) identify that pork barrel policies increase by 26% the chances of a legislator being reelected. The result of pork-barrel political returns holds in the 1998 and 2002 elections (PEREIRA; RENNÓ, 2007).

More recently, Sanfelice (2010) identified that budget amendments positively affect the number of votes won by candidates in the 1994, 1998 and 2002 elections. Analysing the national elections of 1994, 1998, 2002, and 2006 Mesquita et al. (2014) employ various operationalisations to measure legislator's electoral performance and found that although the existence, the effect of pork-barrel politics on vote share was smaller than suggested by the literature – with a considerable variation. Likewise, Baião e Couto (2017) analyzed the effect of the efficiency of budget amendments on the possibility of generating votes using a regression approach with fixed effects and discontinuous regression to analyze the elections for the Chamber of Deputies in 2006, 2010 and 2014. The results suggest that pork matters for the number of votes the candidate raises, with those carried out by municipal governments having the most significant consequence.

In this sense, spillover benefits citizens regarding policy results and legislators with electoral returns. As pork monies are a tool to provide target advantages for the electorate geographically in the attempt to increase electoral support, these two main traits discussed before will shape Congresspeople's strategy while using it: scarcity and its power to generate electoral returns. By sticking to the strategy of focusing on mid-sized jurisdictions – which are crucial locations in the polycentric system – politicians are exploiting the ability to spill over electoral support through the characteristics of electoral geography.

Let me disentangle that. Pork positively affects vote share but is a scarce good. Then, legislators must carefully consider how to deliver the fund making it politically efficient, increasing the odds of credit claiming and guaranteeing the highest electoral returns. To do so, they have to weigh the number of votes available in a given jurisdiction and its ability to increase the scope of its power to claim credit to generate more votes. Designing a strategy is not an easy task. But it is feasible, as Congresspeople are aware of their electoral strengths and vulnerabilities. While not able to know how the electorate will behave on election day, they have complete information on how they performed in the past election. Each Member of the Parliament knows how close she was to not getting a seat and how her vote share was in every local unit within the electoral district. With that information, they cannot change the past. Still, they can create plans to influence the future election.

By learning from her past performance, a legislator can build her support for the next election and try to increase the funds she delivers and geographically designated efforts she employs (AMES, 2003, p. 117). To do so, she will ensure that pork monies reach jurisdictions where it is more straightforward to identify their electorate and increase the ability to claim credit in the future (DIAZ-CAYEROS, 2008). There are a couple of features that benefit this scenario. First, target jurisdictions where they have less electoral competition. This will diminish the chances that free-riders will use the credit generated by their activities (LANCASTER, 1986). Second, allocate distributive resources to benefit jurisdictions where the geography of your vote allows an increase in both the possibility of claiming credit and in the possible electoral returns (AMES, 1995).

In this sense, in line with the strategy designed for the collective effects of the pork, legislators should avoid undertaking efforts to disburse pork monies to larger jurisdictions as it often has a shared electorate, where there are many candidates, and the electorate is more concerned with ideological issues than distribution. Similarly, she should detour from small jurisdictions where although pork spending is most welcome, one candidate usually dominates (AMES, 2003). Once again, medium-sized areas seem more attractive for a strategy that seeks to increase the possibility of electoral support. More specifically, legislators would be able to connect with both the targeted location and the surrounding areas, increasing her support network. This happens via credit claiming – which was potentiated thanks to the overflow of pork barrel's collective effects. In short, the number of people accessing benefits delivered by legislative activities also increases the number of citizens likely to reward the legislator for sending distributive money. Finally, this strategy allows the legislator to negotiate retail with the targeted city and wholesale with neighbouring areas.

To illustrate this idea, I invite the reader to think of a hypothetical case. Let's imagine a constituency within a country. That district can be a state; as in Brazil, a department, as in Peru, or an autonomous community, as in Spain. Let's allow health policies to be implemented by local units in these districts. In this situation, several local governments will implement public health policies for their residents. Following the logic of quasi-market (OSTROM; TIEBOUT; WARREN, 1961; OSTROM; OSTROM, 1977), some local units will have a greater structure to implement policies than others, developing skills and specialization in human activities (Ihlanfelot, 1995; Stchagger and Zemp, 2006). The representatives of that constituency have access to pork-barrel resources and need to allocate them in a way that benefits their electoral objectives. Following the spatial spillover effects argument I developed earlier, instead of concentrating spending on one municipality, the politician would strategically diversify spending on pork barrel policies – the concentration of resources in the core municipalities and some investment in less poor municipalities.

In practice, for example, it would send a larger amount of resources to a central city that would be better able to process the resource into useful benefits for voters and be visible so that the politician can claim credit for them (for example, purchase of hospital materials or

medication). At the same time, the legislator would send a smaller amount of resources to the surrounding cities to buy ambulances and transfer their citizens to the existing hospital in the central city. Through anecdotal evidence, we know that in Brazil there is a large amount of budget amendment resources being allocated for the purchase of ambulances in small municipalities^{5 6 7}.

These disparities exist (ENRIQUEZ; SYBBLIS; CENTENO, 2017; Rodrigues-Silveira, 2019; HARBERS; STEELE, 2020), but pork has no intention to fight them. By delivering pork barrel monies to specific jurisdictions, politicians have no intention of forcing an equalising effect at the local level (BAIÃO; COUTO, 2017) nor allocate pork expenses to localities with greater socio-economic vulnerability (DOMINGOS, 2022). On the contrary, legislators exploit it. They know that delivery of pork-barrel politics and patronage features are especially attractive in situations of inequality and low productivity (ROBINSON; VERDIER, 2003) and use such differentiae in their strategy without much desire to fight against it. Fundamentally, the reasoning behind this is that such a strategy might increase the level of imbalance, but it allows spending to be electorally effective for politicians.

3.4 The political spine of spatial spillover effects

The spatial spillover effects theorised earlier are direct consequences of legislative activity and political reasoning by Congresspeople. Legislators assume an essential role in this relationship either because they act as a distortion point in the allocation of federal funds for subnational units or due to their position as decision-makers in the construction of the strategy of privileges that tries to generate political efficiency of resources considered inefficient. However, they do not operate alone. For the spillover effect to be possible, the legislator must establish a local connection with the electorate. This is impossible without local actors being intermediate in the representative relationship, especially in multi-level frameworks and multi-member districts. At the subnational level, mayors are the brokers enabling the allocation responsiveness that increases legislators' local network of clients.

Let me disentangle that. Politicians running for office have complete information on how they performed at the ballot box in past elections in all sections they have cast a vote, as stated before. Suppose a politician has run for office in a particular district a few elections before. In that case, she might have a sense of the amount of core electoral support she has within different jurisdictions. Although, it is humanly impossible for the legislators to have complete informa-

⁵ "Deputado Luizinho Goebel libera emenda para aquisição de uma ambulância e insumos hospitalares para Campo Novo de Rondônia". Available at: <<https://www.tudorondonia.com/noticias/deputado-luizinho-goebel-libera-emenda-para-aquisicao-de-uma-ambulancia-e-insumos-hospitalares-para-campo-novo-de-rondonia,98053.shtml>>. Accessed Dec 21, 2022.

⁶ "Nova ambulância para Jacutinga". Available at: <<https://www.jornalbomdia.com.br/noticia/60224/nova-ambulancia-para-jacutinga>>. Accessed Dec 21, 2022.

⁷ "Deputado Ezequiel Júnior garante recurso para compra de uma ambulância para o Distrito de Triunfo". Available at: <<https://www.al.ro.leg.br/institucional/noticias/deputado-ezequiel-junior-garante-recurso-para-compra-de-uma-ambulancia-para-o-distrito-de-triunfo>>. Accessed Dec 21, 2022.

tion on the behaviour of the electorate in each area she was voted. Legislators might know how many votes they can gather in some jurisdictions, but they are unaware of voters' preferences, individually or in a group. To access this type of information, which is rather specific, legislators need intermediaries at the local level. People who know the day-to-day life of the population, who understand who the core voters of this electorate are, what the precise behaviour and desires of these voters are, how they behave and how they react to legislative activities that benefit them and how is their level of loyalty towards the representative. These are brokers.

Brokers are local actors that connect voters and representatives. They are the intermediaries of politicians in the jurisdictions they represent. Who creates a relationship with the citizens of the locality, solving daily problems for them, helping with personal favours and in return requesting their votes and participation in political acts (STOKES; DUNNING; NAZARENO, 2014, p. 75). Typically, they are people known in the community who already have some engagement or level of trust in that population. Despite that, there is no single profile of brokers. They can be political activists for the party or people the politician trusts (AUYERO, 2000), friends or relatives of the legislator (ROCHA; GELAPE, 2022), public employees, who can also benefit from patronage (OLIVEROS, 2021) or even mayors (BAIÃO; COUTO, 2017; ROCHA; GELAPE, 2022).

Evidence suggests that producing a local agenda would be almost impossible without the mediation of brokers (AUYERO, 2000; AUYERO; BENZECRY, 2017; CORREDOR, 2020; OLIVEROS, 2021). Also, the electoral connection between local voters and national representatives is intermediate by brokers (BAIÃO; COUTO, 2017, p. 176), as the rooting of brokers in the lives of citizens allows for a link between the representatives in the office and the local voters by allowing the exchange of information about the behaviour of the electorate (HOYLE; GELAPE; SILOTTO, 2021). This relationship is so strong that even when the legislator changes political parties when the relationship between brokers and representatives is consolidated and loyal, there is no loss of electoral capital (NOVAES, 2014).

Broker's work is essential in any situation, but especially in large multi-member districts. In these institutional arrangements, each district has more than one representative. This feature can often blur voters' identification of the legislator who sent geographically located benefits to the area. In such a situation, knowing which area should receive the benefits and will reward it with political support becomes critical, given the level of competition within the district inherent in institutional design. The role of brokers increases its importance, as they are the institutional network allowing to build of the path of success of distributive politics as a tool for gathering votes (KITSCHOLT, 2000) as they interact face to face with citizens (STOKES; DUNNING; NAZARENO, 2014), build trust by being the person who can solve any problems that citizens may have (AUYERO, 2000) and construct a personal connection with voters that facilitates future credit claiming of politicians (OLIVEROS, 2016, p. 377).

Especially concerning the pork-barrelling connection, brokers are fundamental in communicating between voters and politicians. Pork dynamic works on a two-lane road: politicians need

political support to ensure survival in office. Representatives seek political support by providing favourable outcomes (MAGALHÃES, 2016) and focusing on delivering particularised, or club goods (CAIN; FEREJOHN; FIORINA, 1987; SCHWARTZ, 1987; STOKES, 2005; RAILE; PEREIRA; POWER, 2011; CUSTER et al., 2016; BERTHOLINI; PEREIRA; RENNO, 2018). But voters are not naive. Unlike what the mainstream scholarship supposes, the dynamic of receiving material benefits and trading them for votes is a usual practice for the electorate (AUYERO, 2000). Voters are willing to give electoral support if they have something in return. And there is a local demand for distributive politics (RAILE; PEREIRA; POWER, 2011).

Findings from a survey coordinated by Ames, Baker e Renno (2008) in two Brazilian municipalities (Caxias do Sul and Juiz de Fora) in 2002 and 2006 find that 64% of respondents prefer that the Federal Deputy "acts to help the municipality" while only 31% answer that he works on projects of national interest. Similarly, in a 1,025-respondent survey in Slovakia and the Czech Republic, Tóth, Nemčok e Spáč (2021) found out that people are generally critical of pork-barrel monies distribution but only until they find out that they have benefited from it. Furthermore, the preference for distributive goods is especially true when we consider small and more economical (or fiscal) vulnerable subnational units, where the constituency is more aware of the need for schools and health centres instead of a change in the national public health or education policies – in this way, the constituency is inclined to demand more geographically targeted benefits (AMES, 1995; DESPOSATO, 2001; KITSCHOLT, 2000).

While voters need political actors able to intermediate the provision of federal funding for the local level (AMES; PEREIRA; RENNO, 2011), they cannot put straightforward pressure on legislators. Actually, they can try. But this would not be the most effective strategy. Sending an email to the legislator's office is possible but probably less effective (at least slower). This is where the role of brokers comes into play. Brokers are getting things going for the subnational representative at the subnational level (MEIRELES, 2019) and trying to make it possible for them to claim credit for legislative actions that benefit the area later (GOLDMAN; PALMEIRA, 1996; BEZERRA, 1999). So they are the channels through which the population can communicate with the legislator. The construction of this link between the two ends of the electoral connection is super important for the electoral objectives of the legislators, as it enables the allocation responsiveness (EULAU; KARPS, 1977) of the legislative – meaning that the representative's allocation of federal resources reflects the constituency's interests (GOLDEN; MIN, 2013, p. 87). In other words, the brokerage allows voters' hunger for pork-barrel politics can affect the allocation of distributive policies by congresspeople and voters' perception of demand (AMES; PEREIRA; RENNO, 2011, p. 240), signalling congruence between agent and principles ideas of problems and solutions to the district (EULAU; KARPS, 1977).

If the constituency is demanding distributive policy (AMES; PEREIRA; RENNO, 2011) and it is possible to generate collective mobility – even if by appealing to programmatic policies and selective material incentives as well, until reaching a "possibility frontier" (KITSCHOLT, 2000, p. 885), then we can argue a case that delivery of this type of particularised resource is efficient

for both agents and principals. For one, giving what they demand. And for the other, enabling the building of political capital.

3.5 Where spillover matters most

However, this overflow does not occur in a vacuum. Pork barrel allocation and its consequential spillover effects surface among intrinsic disparities between subnational unities regarding taxation and financing (OATES et al., 1972; ARRETCHE, 2004; ARRETCHE, 2010; PERMAI; CHRISTINA; GUNAWAN, 2021). There is no country in the world where all subnational units can equally finance themselves. Consequentially, this will affect all policies and generate dissimilar outcomes. Even if the local government implements this policy, it will face different challenges due to distinct implementation capacities (Otero-Bahamón, 2020). Such differences lead to a very straightforward practical result for this thesis object: it will shape how the effect spills over into neighbouring jurisdictions. But it also shapes how that effect spills over into neighbouring cities.

Different jurisdictions react differently to the same input. Policies hardly ever arrive at the subnational level considering place-specificity. Rather often, they are implemented not considering local features, which can lead to sub-optimal outcomes (Otero-Bahamón, 2020). Nothing is different when we think about distributive politics, as its effects vary across territories as much as the programmatic policies. On top of that, the demand factor also varies greatly. The demand for the fund changes with the jurisdiction's level of need (DESPOSATO, 2001; RAILE; PEREIRA; POWER, 2011). As voters are more aware of local issues which are part of their daily lives (SCHUMPETER, 1956), it is reasonable to think that the electorate will pressure to receive discretionary funding. Also, due to its nature: it is easily recognisable although a type of "myopia" makes it impossible to distinguish the associated costs while dispersing it among other districts (ALMEIDA, 2021). At the subnational level, some jurisdictions need recourse more than others (ARRETCHE, 2010). And at some level, pork monies are a strategy that can deliver public goods to places where other revenues might be unavailable (AMES; PEREIRA; RENNO, 2011).

But distributive politics in general and the pork barrel, in particular, are not intended to be an equalizing tool. Nor do legislators use it for this purpose (BAIÃO; COUTO, 2017; BAIÃO; COUTO; OLIVEIRA, 2020). On the contrary, as discussed earlier, evidence suggests allocation in search of votes. While programmatic and redistributive policies seek to identify the specificity of jurisdictions to equalise them in some way – such as rule-based resource transfers that decentralize federal aid intending to homogenize the provision of local public services –, pork-barrel policies are in search of political specificity that benefits the legislator's electoral objective (MAYHEW, 1974). When targeting pork-barrel, as discussed in the previous chapter, legislators are concerned with the distribution of their votes in that jurisdiction (AMES, 2003; CARVALHO, 2003), the party alignment of the local governor (BROLLO; NANNICINI, 2012; MEIRELES, 2019; VENTURA, 2021), the possibility of receiving campaign resources

through subnational elites (SAMUELS, 2000; BOAS; HIDALGO; RICHARDSON, 2014) and even if they intend to run for the executive seat in that jurisdiction (SAMUELS, 2002; MATOS; POLITI; MORATA, 2020). All this information is essential for generating credit claiming and building the path for electoral support.

Although unintentionally, the pork barrel allocation provides an extra allowance to the budget of some localities at the expense of others (BAIÃO; COUTO, 2017). In places where there are horizontal disparities regarding the ability of tax and generate recourse to implement policy and provide local public goods, intergovernmental transfers are implemented as an equalisation attempt in the provision levels (SHAH, 2006). Where there is no help in building a local structure to improve tax power, these grants can generate the perverse effect of fiscal dependence (MELO, 1996). Therefore, one must consider that its allocation should generate heterogeneous effects between the same jurisdictions.

Empirical evidence suggests that pork has little marginal effects when delivered to more equal localities and where there is no budget restriction. Still, it appears to have a fundamental role for those poorer, less productive, and more unequal places (ORTEGA; PENFOLD-BECERRA, 2008; ROBINSON; VERDIER, 2003). In such a circumstance, pork monies can mean everything for the local financial reality since it is an extra allowance for local government (ALMEIDA, 2021; BERTHOLINI; PEREIRA; RENNO, 2018). They are accounts that allow funding for local public policies, goods and services that have not that were not forewarned in the budget (BUENO, 2018) and can assist the implementation of local demands (CHIAVEGATI, 2006; AMES; PEREIRA; RENNO, 2011).

As pork monies positively affect policy outcomes (SORRIBAS-NAVARRO, 2011; CUSTER et al., 2016; BERTHOLINI; PEREIRA; RENNO, 2018). We have reasons to predict that it is delivered in a concentration pattern following the distributive logic (MAYHEW, 1974; KRINER; REEVES, 2015). Ultimately, this situation generates different levels of access to local public goods and services uniquely based on citizens' location (Rodrigues-Silveira, 2013b; SINGH, 2019; HARBERS; STEELE, 2020). But we know that spacial interdependence plays a role in the local public good arena (OSTROM; TIEBOUT; WARREN, 1961; OSTROM; OSTROM, 1977; SCHALTEGGER; ZEMP, 2003), and commuters might have access to public service provided in other jurisdictions overflowing the pork's positive collective effects across geographical boundaries. Then, the effect of pork barrel on policy is more prominent (for itself and neighbours) when local units have the less fiscal capacity or bigger fiscal dependence.

3.6 When the externalities are not that good

However, not all spillover effects generate positive outcomes. I have highlighted the positive aspect of overflowing pork barrel in the previous sections, reviewing the empirical evidence of its effects on public policy and welfare state indicators and developing an argument that such positive externalities reach more people through the dynamics of spatial spillover effects – where commuters, by having access to local public goods in the city targeted by the pork-barrel,

increase the outcome indicators of their home jurisdictions. Yet, another aspect that needs to be explored is adverse spillover effects. Although the porosity of the borders between jurisdictions generates an overflow that results in favourable policy outcomes, it can generate dangerous incentives for neighbours in other areas, such as investment and policy-making at the local level. That's what I'll discuss in this section.

A positive spatial spillover effect occurs when something beneficial overflows. That is the case that I argue for policy outcomes. More specifically, pork generates positive collective outcomes for policy performance at the local level, and due to spatial dynamics, it overflows for surrounding areas. On the other hand, negative spatial spillover allows those adverse externalities to overflow into neighbouring areas. Let me try to illustrate that with a daily life example. Imagine that a shopping centre has recently opened in your neighbourhood. This will generate more job opportunities and increase income and revenue. Still, it will also somehow increase the traffic in the city, increase real estate speculation and even increase the number of thieves in the surrounding areas. Similarly, when the central city of a metropolitan region starts to increase, it also does the real-state speculation, expelling workers from the region to distant locations and increasing the commuting time to work.

The logic is the same when examining political and economic issues. Something good can lead to negative externalities. A good example is the application of the classical model of Charles Tiebout (1956) to metropolitan regions. His model argues that consumer-clients have preferred taxation and public service provision levels. In short, whenever their community raises taxes or downgrades service provision in a way that is no longer in line with their preferences, they will "vote with the feet" and move to the location that best suits them. In a metropolitan system, whenever the central city starts to develop and increase service provision, the taxation levels rise, leading to people's reactions of moving out to nearby communities with less tax pressure (SCHALTEGGER; ZEMP, 2003).

When we bring this discussion to pork-barrel monies and the spatial dynamic between the jurisdictions nearby the city, we account for another substantial effect other than the positive spillover in policy outcomes: spillover effects on spending. Scholars argue that the spending decisions of a local unit influence the choice of neighbouring units, generating either positive or negative externalities (CONLEY; DIX, 1999; SOLÉ-OLLÉ, 2006; ERMINI; SANTOLINI, 2010; SIANO; D'UVA, 2017). In other words, the investment in policy in one jurisdiction influences how much its surrounding units will spend themselves. It would either happen through the spillover model discussed before, where commuters engage in free-riding behaviour and benefit from local public goods promoted by local units where they do not reside or through competing jurisdictions due to information flow and judge their local government performance – the yardstick effect (BESLEY; CASE, 1992; HAYASHI; YAMAMOTO, 2017).

Empirical evidence suggests that positive spatial spillover can occur regarding local expenditure. Solé-Ollé (2006) analyse central Spanish cities and their neighbours to identify if there exists fiscal and growth spatial spillover effects. He applied a dynamic model for the years 1991

to 2001. He found out that the growth and capital stock of the central city spill over to surrounding localities, suggesting that the concentration of financial resources in the central city is beneficial. Likewise, Ferraresi, Migali e Rizzo (2018) analyse Italian municipalities between 2001 and 2011 and identifies that the spatial independence of jurisdictions regarding spending decisions generates a positive spillover effect – incentives neighbours to spend more.

But there is also evidence of the contrary hypothesis. Schaltegger e Zemp (2003) identify negative spatial dependence on security expenditure, analysing Swiss communes. Lundberg (2006) and Akai e Suhara (2013) determine the same negative spatial dependence on culture-related spending in Switzerland and Japan, respectively. Similarly, López, Martínez-Ortiz e Cegarra-Navarro (2017) identifies spatial dependence in spending by Spanish municipalities. In this sense, expenditure can lead to negative spatial dependence as it has a substitute nature. Since the provision of local public goods can spill over and benefit commuters that can access the welfare service and goods from one local unit, there is no primary necessity for the neighbour unit to put effort and increase their spending on these matters (LÓPEZ; MARTÍNEZ-ORTIZ; CEGARRA-NAVARRO, 2017). Considering this and that pork-barrel resources would go to a specific jurisdiction, which is more likely to turn those resources into positive public policy outcomes. In contrast, neighbouring and less capable jurisdictions receive less money, and it is unlikely they will engage in producing good public services. On the contrary, local governments could act as free riders in providing central city services and proceed with a "race to the bottom".

This strategy favours jurisdictions with selected features and will likely create spillovers that will avail electoral goals. However, it can generate a perverse side effect which, although consistent with the nature of distributive spending, is rather harmful: to foster disparities among subnational units. The strategy foresees the concentration of pork spending in locations with some economic, material and human structure since this is a necessary condition for the perfect processing of the resource received. While the collective positive effect manages to spill over to neighbouring cities to some extent, spending concentrated in medium-sized units reaffirms the horizontal funding disparities between subnational units in a country. Furthermore, it is very likely that the effects that spill over to the surrounding units, as they are indirect, are smaller and less systematic than those generated in the targeted unit. Thus, they are unable to reduce the disparity between jurisdictions.

3.7 Institutional framework: The Brazilian distributivism

Brazil is a country of continental dimensions. It has a territory of 8.516.000 km² where about 200 million inhabitants live⁸. They are distributed in five macro-regions, 26 states, a federal district and 5,570 municipalities. Its political system is a multiparty presidentialism with bicameralism. In the Lower House, the *Câmara dos Deputados*, 513 deputies are elected every four years through open list proportional representation through multinomial districts and

⁸ For more information: <<https://censo2010.ibge.gov.br/noticias-censo.html?busca=1&id=3&idnoticia=1766&t=censo-2010-populacao-brasil-190-732-694-pessoas&view=noticia>>. Accessed on Sep 02, 2022.

following a population proportion of these districts. In turn, the Federal Senate is the Upper Chamber. Each state elects the senators by majority rule for 8-year terms, following a renewal of a third and two-thirds in interval elections.

Brazil is organised through three-layer federalism containing the Federal Union, States and Municipalities, where subnational units elect their executive and legislative power. Brazilian federalism has a solid historical foundation, dating back to the proclamation of the republic in 1889. At the time, the design implemented upheld the autonomy of the states, in addition to guaranteeing a minimum intervention by the Federal Government (ABRUCIO, 1994). However, during dictatorial periods the power and intervention of the Union were growing bigger (ARRETCHE, 2012; ABRUCIO et al., 2020). It wasn't long ago that Brazilian Federalism gained the contours of the design we know today. As a reaction to the authoritarian constraints of the preceding periods, an intense municipalisation process took place during the advent of the 6th Republic (ARRETCHE, 2004). With the promulgation of 1988's constitution, municipalities were elevated to the status of a subnational entity.

But with a new status come new responsibilities. The Citizen Constitution⁹ also made the municipalities the main responsible for implementing and financing public policies of primary education and healthcare (ARRETCHE, 2012). According to articles 198 and 211 of the Constitution¹⁰, the three Federal entities must cooperate to guarantee the best implementation of education and health policies. Still, the municipalities are primarily responsible for their implementation and funding. Regarding education, municipalities should provide kindergarten and elementary education. Despite de cooperation, the local government is the predominant investor since they have the constitutional obligation to apply at least 25% of its annual revenue resulting from taxes in the maintenance and development of the local education system. Concerning health policy, the *Sistema Único de Saúde* (Unified Health System, in English) is also funded through the cooperation of the three federal entities. However, municipal governments will manage and hire community agents, execute health programs and projects, and respond to emergencies. In addition, it must invest around 15% of its annual tax resources in financing the healthcare policy.

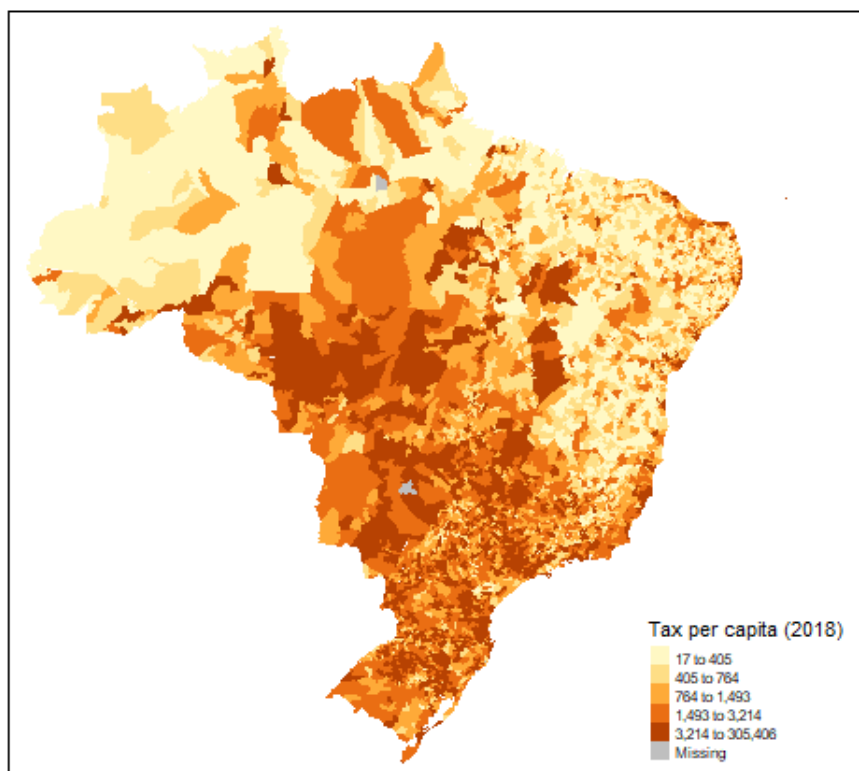
Nonetheless, while the policy implementation was decentralised, the taxation power was concentrated in the Federal Government, which collects four of Brazil's five most considerable taxes (ARRETCHE, 2004). Until today the capacity to generate revenue differs horizontally among states and municipalities. For example, about 32.5% of Brazilian municipalities cannot generate sufficient resources to cover their administrative structure expenses (FIRJAN, 2021). Using data from Finanças do Brasil (FINBRA) website, which discloses the finances of local governments in Brazil, figure 2.5 shows the amount of taxes collected by each municipality in the year 2018. The map allows us to observe a meaningful variation in the amount of taxes each local government holds. And it also shows us the clusters in the north and northeast regions,

⁹ "Constituição Cidadã" as the 1998's constitution became known due to its concern with social issues and rights.

¹⁰ Please find the Constitutional text at <https://www.planalto.gov.br/ccivil_03/constituicao/constituicao.htm>. Accesses at Dec 08, 2022.

which systematically have a lower taxing capacity compared to the southeastern and southern regions. This evidences the horizontal fiscal disparities among Brazilian subnational unities (ARRETCHE, 2002).

Figure 1 – Tax by municipality



Source: The author with data from *Finanças do Brasil*.

To deal with the situation of financial disparity among municipalities and in an attempt to guarantee equalisation in public services provision, the Federal Government implement intergovernmental fiscal transfers (SHAH, 2006; BOADWAY; SHAH, 2007). They decentralise federal resources to subnational units, helping them finance policy implementation and service delivery at the local level. But transfers do not come alone. They arrive with guidelines to be followed. Thus, generating revenue is essential for municipalities, especially to guarantee the implementation of long-term projects without worrying about guidelines coming from another level of government (FIRJAN, 2016). Nevertheless, these transfers can generate negative effects, such as fiscal dependence, when municipalities have most of their resources coming from higher federal levels (MELO, 1996). In Brazil, the level of dependence on these intergovernmental transfers is relatively high (ARRETCHE, 2010; ARRETCHE, 2002). To exemplify, only

20% of the municipalities can generate their local revenue by themselves¹¹ and about 57% of the municipality revenue comes from these grants¹².

These intergovernmental transfers can be of two kinds: rule-based, which follows a pre-assigned rule for distribution and is often based in the constitution¹³, and discretionary, that don't¹⁴. In comparative terms, the most decentralised resource for Brazilian municipalities comes from constitutional transfers. Of these, three stand out. First, the *Fundo de Participação dos Municípios* (FPM), which is composed of the collection of both income and industrialized product tax, and whose distribution rule considers the number of inhabitants across population groups¹⁵. Second, *Fundo de Manutenção e Desenvolvimento da Educação Básica e de Valorização dos Profissionais da Educação* (Fundeb), is the permanent instrument for financing public education in Brazil (Law no. 14.113/2020)¹⁶ and its resources come from taxes, transfers and the complementation of the Union - which occurs every time the minimum value of the student/year does not reach the minimum defined nationally¹⁷. Lastly, the *Fundo Nacional de Saúde* (FNS), for health expenses funded in 45% from the DPVAT tax, in addition to the percentage of 12% and 15% constitutionally guaranteed for states and municipalities, respectively¹⁸.

But those are not the only transfers received. Brazilian municipalities are also entitled to receive the so-called voluntary transfers (*Transferências voluntárias*, in Portuguese) - which are discretionary, not rule-based and often provide financial resources for the conclusion of cooperation aid or financial assistance¹⁹. These may come to the municipality from negotiations between the local and federal government or even, in case of extreme need – such as emergency in the event of natural disasters. In addition to these, there is another type of discretionary resource that municipalities may receive: the budget amendments ("*emendas orçamentárias*", in Portuguese).

This type of resource, although also discretionary, is different because legislators are the decision-making point for its allocation. Further, they are also intrinsically connected with the nature of the Brazilian presidential system, which organises the Executive branch based on big coalitions to guarantee governability (ABRANCHES, 1988, p. 21). This arrangement is very

¹¹ For more information, see the report at: <<http://publicacoes.firjan.org.br/ifgf/2013/files/assets/basic-html/page1.html>> Accessed on Sep 02, 2022.

¹² According to the OCDE report on Brazil. For more information, see: <<https://www.oecd.org/regional/regional-policy/profile-Brazil.pdf>>. Accessed on Sep 02, 2022.

¹³ Please, find more information on the constitutional transfers at <<https://portal.tcu.gov.br/lumis/portal/file/fileDownload.jsp?fileId=8A8182A24D6E86A4014D72AC815C53B0&inline=1>>. Accessed on Dec 08, 2022.

¹⁴ Please, find more information on the constitutional transfers at <<https://www.gov.br/plataformamaisbrasil/pt-br/sobre-a-plataforma-mais-brasil/transferencias-discricionarias-e-legais>>. Accessed on Dec 08, 2022.

¹⁵ For more information, please see: <https://sisweb.tesouro.gov.br/apex/f?p=2501:9:::9:P9_ID_PUBLICACAO_ANEXO:6370>. Access 02 sep. 2022.

¹⁶ Available at: <<https://www.in.gov.br/en/web/dou/-/lei-n-14.113-de-25-de-dezembro-de-2020-296390151>>. Accessed on Sep 02, 2022

¹⁷ See: <<https://www.fnede.gov.br/financiamento/fundeb/sobre-o-plano-ou-programa/sobre-o-fundeb#:~:text=O%20Fundo%20de%20Manuten%C3%A7%C3%A3o%20e,dos%20Estados%2C%20Distrito%20Federal%20e>>. Accessed on Sep 02, 2022

¹⁸ For more information, see <<https://portalfns.saude.gov.br/sobre-o-fns/>>. Accessed on Sep 02, 2022

¹⁹ For more information, see <<https://www.gov.br/mdh/pt-br/acesso-a-informacao/convenios-e-transferencias>>. Accessed on Sep 02, 2022

prone to bargaining, as it allows the National Congress to have a straightforward access route to the Federal Government than other types of the presidential system. In his day-to-day work, the executive must build support for approving reforms and projects in the National Congress. On the other hand, legislators crave benefits for their electorate. In the Brazilian coalition presidential system, negotiation with parties that hold a ministry may not be enough in certain situations, and it is necessary to haggle with each legislator. This is where budget amendments come into play. The Executive exchanges amendments for support, and legislators use it to benefit their electoral bases (BAIÃO; COUTO, 2017; LIMONGI; FIGUEIREDO, 2005; PEREIRA; RENNO, 2003; VASSELAI; MIGNOZZETTI, 2014; PIOLA; VIEIRA, 2019).

Although much analysed by the discipline, this tool has not been around for a long time. Historically, the construction of the federal budget was the sole responsibility of the Executive branch, and legislative participation was merely confirmatory (accepting or rejecting the allocation suggested by the Executive Branch). But in 1988, the ritual for approving the annual budget changed. Nowadays, the Executive branch still has exclusivity in initiating budget matters, but Congresspeople are also part of it: they can amend the budget project individually and collectively. Each legislator can add up to 25 amendments to their represented district annually, with a value defined by the "budget rapporteur" ²⁰. In short, amendments are the official currency of the Brazilian National Congress.

Due to its political effects, this transfer is significant in the Brazilian political dynamic, especially for the Federal Deputies that are elected by an open-list proportional representation with high district magnitudes and have incentives to target benefits (COX, 1990; DOWNS et al., 1957). This generates internal competition on party lists, and consequentially, elected legislators tend to use pork-barrelling as a strategy to differentiate themselves (AMES, 1995; CATALINAC, 2018) either to get reelected (PEREIRA; RENNO, 2003; BAIÃO; COUTO, 2017) or get elected for the executive in the local level (SAMUELS, 2000). And budget amendments act as the perfect functional equivalent of pork barreling.

Despite being widely used as a bargaining tool, the National Congress recently pulled out a smart move that scored them a victory and more autonomy regarding the budget amendments. In 2015, the approval of Constitutional Amendment 86 slightly altered the dynamics between the executive and the legislature. The new law establishes the obligation of executing individual parliamentary amendments up to 1.2% of net current revenue for the previous year's budget – with half of this percentage allocated to the execution of health-related amendments. As a result, there was a decrease in the executive's bargaining power regarding the use of amendments as an exchange currency. But they are still relevant. Data referring to budgets leave no doubt about their importance. In 2022, 16,5 billion Brazilian reais were dedicated for budget amendments subjected to an allocation by the "reporteur", while in 2021, 7,3 billion Brazilian reais

²⁰ Please, see more information at <<https://www12.senado.leg.br/noticias/glossario-legislativo/emendas-ao-orcamento>>. Accessed Dec 08, 2022.

were allocated by political parties' benches. Other 9,6 billion Brazilian reais were available for individual parliamentary amendments²¹.

In short, the budgetary amendments are the moment where both Federal Deputies and Senators can influence the destination of the Federal Budget while benefiting their constituency by sending 25 earmarked funding for specific project²². In their fiscal nature, they are nothing more than a fiscal transfer from other intergovernmental transfers (meaning that it is the decentralisation of resources from the Union to the subnational level, such as constitutional or ruled-based ones). But one main feature stands out: budget amendments are a resource whose receipt is not conditioned by individual support or allocation rules²³. Therefore, imposing budget amendments are implemented without the need for prior negotiation with the executive branch. Giving plenty of credit claiming possibilities to legislators and enabling a superior perception of their expressed will on which locations they want to benefit. Furthermore, as they have mainly focused on health, they allow for a more detailed analysis of the collective effects of the pork-barrel policy.

In this sense, Brazilian budgetary amendments might help to further the knowledge and understanding of the puzzle proposed in this thesis, as they're: (i) non-programmatic, (ii) whose receipt is not conditional on individual support and (iii) where the target of benefits are not individuals (STOKES; DUNNING; NAZARENO, 2014). Also, in the Brazilian literature, they are known as the distributive tools par excellence (LIMONGI; FIGUEIREDO, 2005), being used as a proxy for pork-barrel by scholars (BAIÃO; COUTO, 2017; BAIÃO, 2016; VASSE-LAI; MIGNOZZETTI, 2014; MESQUITA et al., 2014; ALMEIDA, 2021; SILVA, 2011; SPÁČ, 2020).

In addition to holding an institutional proxy for pork barrel politics, Brazil also suffers from subnational inequalities (Rodrigues-Silveira, 2019). Not only referring to the subnational variation of income inequality – that varies significantly within the national territory, including differentiating southern and northern states (MAURO, 2021) but also referring to the variation in implementation and outcome of public policies (NIEDZWIECKI, 2018). Data from IBGE Cidades²⁴ support that the provision of public services varies within the national territory. For example, the Pernambuco municipalities of Flores and Carnaíba are only 23 kilometres apart. Still, they have different educational indicator results: while Flores has an age/grade distortion rate of 15.5, Carnaíba has a rate of 8.7.

²¹ "Municípios podem solicitar on-line recursos por meio de emendas do relator". <<https://www.fgm-go.org.br/municipios-podem-solicitar-on-line-recursos-por-meio-de-emendas-do-relator/>>. Access 04 may 2022.

²² "O que são emendas orçamentárias" Available at <<https://siconv.com.br/o-que-sao-emendas-parlamentares/>>. Accessed Sep 09 2022.

²³ Although there is no need to link the resource to any other part of the federal budget, the budget amendments are prohibited from allocating resources to pay personnel, social charges and debt service. Furthermore, allocations that may "involve programming destined for financial expenditure (RP 0) or mandatory primary expenditure (RP 1)" are vetoed. More information is available at <https://www.camara.leg.br/internet/comissao/index/mista/orca/orcamento/or2021/emendas/Manual_Emendas.pdf>. Accessed on April 29, 2022.

²⁴ "IBGE Cidades". Available at: <<https://cidades.ibge.gov.br/>>. They were accessed Sep 09 2022.

Similarly, although Brazilian citizens have access to health policies across the country, their quality can vary significantly. In the southern state of Santa Catarina, the city of Caçador had an infant mortality rate of 12.17, a rate of 0.1 hospitalizations for diarrhoea and held 5 Unified Health System (SUS) establishments. Meanwhile, just 83 kilometres away, Porto União has an infant mortality rate of 2.57, a diarrhoea hospitalizations rate of 1.2 and 16 SUS establishments. One hundred kilometres separate the municipalities of União de Minas and Campina Verde, which have disparities in health indicators: while the infant mortality rate of União de Minas in 2017 was 21.74, Campina Verde managed to maintain a rate of 12.42. In Minas Gerais, besides the state experiencing a decrease in infant mortality rates, there is a significant variation in the micro-regions (FARIA; SANTANA, 2014). Regarding the high complexity hospital care network, there is a substantial regional inequality as well: few centres provide this type of care and about half of the municipalities are discontinued from this network (OLIVEIRA; CARVALHO; TRAVASSOS, 2004). In line with the figure 2 shows. With that information, it becomes clear that Brazilians have access to different qualities of services based on their geographical position.

That been exposed, I choose to analyze health policy outcomes for two main reasons. First, health policy is highly targeted by legislators (MIGNOZZETTI; CEPALUNI, 2019), in addition to having priority among individual budget amendments – since about half of the impositonal budget amendments are allocated to health projects²⁵. Second, health indicators change more quickly than education indicators, for example, as it is easier to buy hospital beds and hire more doctors than to observe the effect of investment in improving learning outcomes of children - and, as pork-barrel resources have a dissipative effect that lasts almost two years (BERTHOLINI; PEREIRA; RENNO, 2018), it is easier to capture their impact in this type of result.

All the features discussed in this section make Brazil the ideal case for testing hypotheses regarding the overflowing feature of pork barrel policies at the subnational level. The Brazilian institutional arrangement benefits the analysis as it provides a framework for working with more than 5,000 municipalities, allowing the understanding of heterogeneous effects under the same institutional incentives and electoral features (TOUCHTON et al., 2020; WAMPLER; SUGIYAMA; TOUCHTON, 2019). Additionally, the subnational variation in political and fiscal aspects combined with the almost exclusive obligation to implement essential healthcare services and the natural proxy for pork-barrelling make the country a worthwhile case to analyse the local and territorial dynamics of pork-barrel effects. Also, the researcher can leverage its vast amount of publicly available data on budget, policy outcomes, and political and economic indexes. Taken together, these main feature benefits the analysis. It allows the most likely and least likely cases to show some variation in the outcomes regarding the empirical expectations from the framework I propose in this thesis. Still, they also can relate to the case findings.

²⁵ For more information, see: <<https://www.camara.leg.br/noticias/452703-emenda-constitucional-do-orcamento-impositivo-sera-promulgada-ao-meio-dia/>>.

4 Data and methods

The previous chapter develops the theoretical basis of this thesis. Pork barrel policies influence the electorate's daily life as they positively affect public policy in the target jurisdiction. But its impact must be even bigger when considering the existing spatial spillover effects, which also permits it to affect the neighbouring jurisdictions positively. Spatial interdependence among local units and the strategic allocation of pork monies draw this overflowing feature. The restriction on the amount of pork barrel policies available for distribution forces politicians to target medium-sized units with distributive politics, as they can absorb the demand of neighbouring areas and better process the benefit due to human and material resources. Consequently, spatial spillover effects increase the pork's beneficiary network, helping to mitigate its inefficiency and becoming politically efficient despite increasing subnational unevenness in policy provision.

I leverage municipal-level information on pork barrel politics and public policy indicators to test this claim. Using Brazil as a case, I gathered data on 33,240 impositional budgetary amendments, which are the pork barrel tool par excellence (LIMONGI, 1994) to operationalise the explanatory variable and health indicators for Brazilian municipalities for 5,214 municipalities as the dependent variable. The dataset comprehends the five budgetary years (2014-2018). Since it is impossible to assign pork monies to localities randomly, and their allocation is too endogenous to argue a case that could work as an exogenous shock, I use observational data ¹. Furthermore, to explore the geographic heterogeneity and analyse the spatial spillover effects required for this analysis, I apply the Spatial Durbin Model that accounts for the interdependence among local units and verifies both the direct and indirect effects in target units and their

¹ Although the Geographic Regression Discontinuity Design (GRDD) approach (KEELE; TITIUNIK, 2015) also allows the analysis of spillover effects, it is a suboptimal approach when policies are grouped together, making interpretation difficult (KONDYLIS; LOESER, 2019). GRDD is an excellent tool for understanding the effect of receiving pork-barrel policies or not. But as the main objective of this work is to identify the spillover effect of receiving pork barrel policies on health policies, the adoption of an SDM regression strategy ends up being chosen because it takes into account both the geographical characteristic (as well as the GRDD) but also allows the analysis of the total and indirect effect between subnational units.

neighbouring municipalities, respectively². I performed the analyses in R and RStudio³. Scripts are available at GitHub repository⁴, and all replication materials are stored in my Open Science Framework⁵.

To dive into detail about the empirical strategy, this chapter proceeds as follows. I first discuss the spatial approach adopted in the empirical strategy and talk the reader through the modelling for testing the theoretical claims proposed in this thesis. Next, I set the scope conditions for this analysis to political and fiscally decentralised countries. Finally, I discuss the data used for this analysis by presenting the operationalisation and measurement of variables while also justifying the methodological choices taken.

4.1 When space matters: modelling pork barrel's spatial spillover effects

Social and political phenomena are not randomly distributed. Various aspects of social and political life are clustered in space (HARBERS; INGRAM, 2019). When we analyse political, social and economic aspects, we can notice a spatial agglomeration of these phenomena. Votes for a given candidate tend to be concentrated in one region (AMES, 2003), as well as the highest levels of education (SACCO; FALZETTI, 2021) and even the worst levels of political violence (BECK, 1999) tend to be geographically related. This proximity signals the spatial dependence on indicators of interest to social researchers. In other words, closer things are more related than those that are further away (TOBLER, 1970, p. 236). However, this characteristic has been recurrently neglected. Researchers of comparative politics generally construct their analyzes based on the idea that units are perfectly interdependent on each other, given the creation of political-geographic boundaries (HARBERS; INGRAM, 2019). Often, researchers' deepest level of attention to this factor is to consider them for standard error corrections (JR; HAYS, 2008; SALVATORE; RUGGERI, 2021).

But when space matters for the analysis, ignoring spatial factors can lead to biased and inconsistent regression coefficients (Greene, 2005; Elhost, 2010, Anselin, 1988). In line with this idea, my argument suggests that the effects of pork-barrel policies may be greater than those presented by previous studies that identified a positive effect of pork on policy outcomes and social welfare indices (SOLÉ-OLLÉ, 2006; ROBERSON, 2008; CUSTER et al., 2016;

² One concern is concerning the endogeneity that exists because of the distributional characteristic of transfers from the federal government to subnational entities (HIROI, 2019). A classical approach to overcome the fundamental inference problem (RUBIN, 1974; HOLLAND, 1986) is to use the Propensity Score Matching (PSM) approach, as Bertholini, Pereira e Renno (2018) chose to do. PSM is a good tool to identify the effect of an intervention (in this case, pork barrel policies) on a specific group by comparing it to a group similar to it where that intervention did not occur (BATISTA; DOMINGOS, 2017). However, for the purposes of my research, this approach is also sub-optimal because a large portion of the municipalities receive some form of pork barrel policies, even if in small sums, reducing the possibility of creating adequate treatment groups and also because the strategy does not allow the identification of spatial spillover effects.

³ I used "dplyr", "geoBR", "sp", "spdep" and "spatialreg" packages to perform the main spatial analysis and descriptions.

⁴ Please visit my GitHub repository here <<https://github.com/amandadomingos/tese>>.

⁵ Please visit my OSF repository here <https://osf.io/cahge/?view_only=729b4ffb96bb4fac8084de88d9bd68ef>

BERTHOLINI; PEREIRA; RENNO, 2018) precisely because they ignore the existing spatial dynamics between subnational units. More specifically, my argument assumes that pork barrel policies have two types of effects. First, an absolute effect on public policy in the jurisdiction targeted by the legislator. In other words, the effect on the city that is the official destination of the pork-barrel policy. Second, a relative effect on jurisdictions close to the targeted cities. That is, a local unit receiving distributive resources from pork barrels generates a series of effects in the surrounding jurisdictions.

By assuming that the local units are not independent, I admit the possibility of spatial dynamics influencing policy outcomes at the subnational level. With this, I entrepreneur an endeavour to contribute to scholarship by addressing the spatial interdependence among geographical units in the relation – that is often modelled as a nuisance and left to corrections by standard errors (JR; HAYS, 2008) and although considered by scholars on subnational variation (Rodrigues-Silveira, 2013b; LUNA; SOIFER, 2017; GIRAUDY; MONCADA; SNYDER, 2019; HARBERS; INGRAM, 2019) have been mostly neglected by studies on the effects of pork barrel on policy and welfare. The subsequent sections discuss the modelling construction and the data nature.

To test to what extent pork barrel policies effects overflow to neighbouring areas of target jurisdictions, I constructed a spillover model to analyse its effects on Brazilian municipalities' health policy. The hypotheses suggest that a municipality's health policy is a function of (1) its own characteristics but also (2) the features and output of its neighbours. My empirical approach uses spatial modelling to account for the spatial interdependence between local unities. Specifically, I propose employing the Spatial Durbin Model (SDM).

This specification considers spatial interdependence in both dependent and independent variables. In addition to that, SDM allows me to discern between direct (the influence of an independent variable on the dependent variable for a local unit) and indirect effects (the spatial spillover effects, meaning how it influences the neighbouring unit's outcomes)(SALVATORE; RUGGERI, 2021). Empirically, it authorises me to analyse geographical overflow related to spatial interdependence among municipalities (VINCENT; KWADWO, 2022) and to account for different values of the spillovers across variables by including exogenous spatial lags (YESILYURT; ELHORST, 2017). Another advantage of this model is that it addresses the possibility of omitted variables by adding an exogenous spatial lag variable (LIU; GRIFFIN; KIRKPATRICK, 2014). The SDM proves to help understand relations between regional observations and local government as it considers the neighbouring observations on both sides of the equation (LESAGE; DOMINGUEZ, 2012, p. 526).

The three main observational consequences of the argument proposed in the previous chapter are that the pork barrel affects the jurisdiction targeted by the legislator and nearby jurisdictions (h1). Furthermore, the effect of pork monies on policy increases when the target locality is a medium-sized city – due to the capacity to process the discretionary benefit received (h1a). Finally, also in municipalities with greater fiscal dependence on intergovernmental transfers

(h1b). Then, to analyse the spatial spillover effect of pork barrelling on health policies both in a local target unit and the neighbouring jurisdiction, I propose a general empirical Spatial Durbin Model shown in equation 1:

$$Y = \delta \sum_{j=1} \omega_{ij} Y_{ij} + \beta X_{it} + \gamma \sum_{j=1} \omega_{ij} X_{ijt} + \varepsilon_{it} \quad (4.1)$$

Where Y represents the dependent variables of a unit i at time t ; W_{ij} represents the row element of the spatial weights matrix for neighbourliness. X_{it} means the row of observations of independent variables, then representing the effect of the neighbours in the count i itself.

Positive δ coefficients mean that neighbours behaviour similarly, while negative means otherwise. In other words, positive δ results indicate that if pork monies positively affect the health policy at municipality i , their neighbours will experience a similar effect. Otherwise, a negative result means that pork monies decrease health indexes in the municipality i while decreasing in their neighbours. β represents the direct effect of pork monies on dependent variables, and γ means the effects of neighbours' independent variable.

To test hypotheses H1a and H1b, an interactive term is added to the equation, which becomes:

$$Y = \delta \sum_{j=1} \omega_{ij} Y_{ij} + \beta X_{it} + \beta D_{it} X_{it} + \gamma \sum_{j=1} \omega_{ij} X_{ijt} + \gamma * \sum_{j=1} \omega_{ij} D X_{ijt} + \varepsilon_{it} \quad (4.2)$$

Where D represents the interaction variable. For hypothesis 1a, whether the jurisdiction has complex level healthcare services in the municipality and for hypothesis 1b, the local unit fiscal dependence. Correspondingly, $(\beta * \beta)$ represents how the variable modifies the impact of pork monies in the dependent variable, and $(\gamma * \gamma)$ represents its spatial interaction.

A final empirical implication of the theoretical framework proposed in the previous chapter is that despite increasing access to the positive effects of the pork-barrel policy, the spatial spillover effects are insufficient to break the direct effects of the dynamics of resource concentration in some jurisdictions. In other words, although the spatial spillover effects expand the effects of the pork barrel in the territory, they cannot reduce the subnational disparity in public policy.

4.2 Scope condition: politically and fiscally decentralised countries

This research has a conditional scope for political and fiscally decentralised units. Countries with such characteristics allow for two critical situations for this research. First, political decentralisation gives authority to subnational entities implementing public policies, making them fundamental actors in the provision of public services to citizens (LIJPHART et al., 2003; CEPAL, 2005; BOSSUYT, 2013). By bringing decision-making closer to the voter, although it increases the level of transparency and accountability (ANASTASIA, 2004; NORRIS, 2018), it generates more substantial variation in the provision and result of public policies – since local

units have different capacities regarding human and material resources (ARRETCHE, 1996; ARRETCHE, 2004; ROGERS, 2021). On the other hand, countries with fiscal decentralisation recurrently present fiscal disparities between subnational entities (MELO, 1996; ARRETCHE, 2010) and implement intergovernmental transfers (SHAH, 2006). Both conditions allow pork barrel policies to play a more meaningful role in delivering public services. Contrariwise, I do not expect pork barrel policies to significantly affect countries that are not politically or fiscally decentralised due to the lack of protagonism of fiscal transfers and especially pork monies for implementing local policies in such a context.

4.3 Data

For the empirical analysis of this thesis, I created an original cross-sectional time series database from secondary sources. To do so, I combined budget information from the Brazilian National Treasure department⁶, the Electoral Supreme Court (TSE)⁷ for data on national and subnational elections. For data on health policies, I used the DATASUS portal⁸ and lastly, for contextual information, I have used data from *Instituto Brasileiro de Geografia e Estatística* (IBGE)⁹ and *Câmara dos Deputados*¹⁰.

The dataset has information on Brazilian municipalities over five budget years (2014-2018) and allows me to analyse a total of 33,240 impositional budgetary amendments allocated among 5,214 municipalities. This time frame benefits the research by encompassing two legislatures in the Brazilian Chamber of Deputies (54th and 55th). It also allows me to deal with the dynamics of two different subnational (2012 and 2016) and national (2014 and 2018). Also, between 2014 and 2018, Brazil had the presidential terms of Dilma Rousseff (2014-2016) and Michel Temer (2016-2018).

Additionally, I consider this enough time to identify the association between the dependent and independent variables. Preliminary studies suggest that the amendments' effect lasts at least two years in social welfare indicators (BERTHOLINI; PEREIRA; RENNO, 2018), so five years should be enough to identify such spillover effect as well. At the same time, such a time frame is an endeavour to expand the analysis compared to previous studies (BAIÃO; COUTO; OLIVEIRA, 2020; BAIÃO; COUTO, 2017; MESQUITA et al., 2014; BERTHOLINI; PEREIRA; RENNO, 2018) allowing for more variation both between units and concerning the political context in terms of intergovernmental relations. This seems to be a time-wise strategy that ensures that the research's multilevel dynamics are understood comprehensively, allowing the variation of political actors (and, therefore, political dynamics) in the three levels of Brazilian federalism (Federal, State and Municipalities).

⁶ Please see the Finanças do Brasil website, maintained by the Treasury Secretary available at: <https://siconfi.tesouro.gov.br/siconfi/pages/public/consulta_finbra/finbra_list.jsf>. Accessed Jan 17th, 2023.

⁷ To obtain electoral data, I used the "cepesR" and "electionsBR" R packages.

⁸ Please see <<https://datasus.saude.gov.br/>>. Accessed Jan 17th, 2023.

⁹ Please see <<https://www.ibge.gov.br/estatisticas/downloads-estatisticas.html>>. Accessed Jan 17th, 2023.

¹⁰ Please refer to <<https://www.camara.leg.br/deputados/quem-sao>>. Accessed Jan 17th, 2023.

4.3.1 Explanatory variables

The main goal of this thesis is to unveil to what extent pork barrel's effects overflow to neighbouring municipalities. To test this, my study variable is pork barrel politics. For secondary objectives, I try to understand how these spillover effects behave in cities that concentrate on public policy demand in a given region and in jurisdictions that are fiscally dependent on federal transfers. To do so, I employ two interactive variables: city status and fiscal dependence. In this section, I present the measurement of each one of them, in addition to dwelling on the methodological choices regarding each one of them.

Pork barrel. In Brazil, budgetary amendments are the distributive tool par excellence (LIMONGI, 1994) and have been employed as a proxy for pork-barrel for a while now (FIGUEIREDO; LIMONGI, 1999; AMES, 2003; CARVALHO, 2003; MESQUITA et al., 2014; SILVA, 2011; BROLLO; NANNICINI, 2012; VASSELAI; MIGNOZZETTI, 2014; PIOLA; VIEIRA, 2019; BUENO, 2018). Following this methodological tradition, I use the Brazilian budgetary amendments to measure pork barrel politics. However, I only use the per capita value of individual impositional budgetary amendments that each municipality receives in a given year.

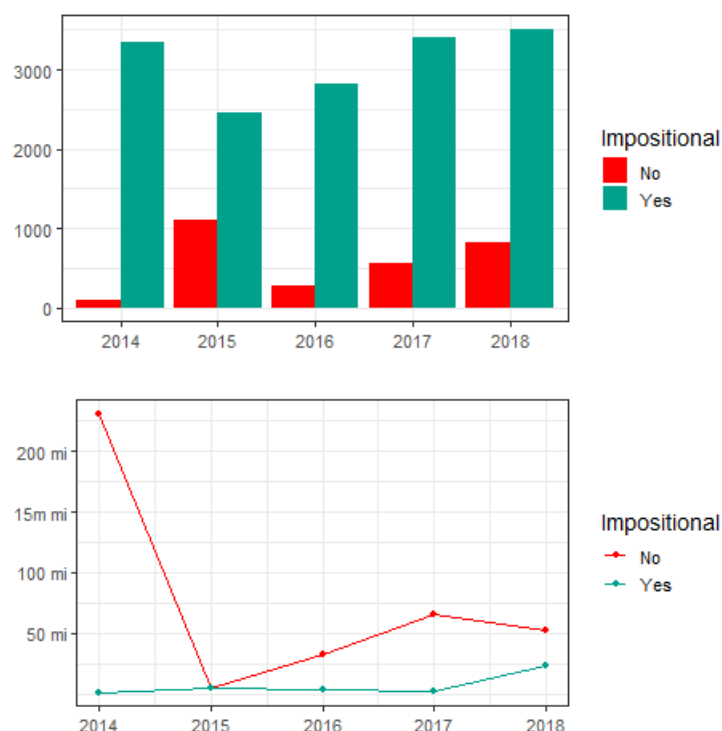
My choice to restrict my analysis to this type of amendment is justified in two main ways. First, I choose to restrict the analysis to individual amendments because it allows the most unrestrained credit claiming. Despite the possibility of proposing collective amendments – whether with other representatives of the same state or with commissions –, the individual amendments must be the ones where the representative fingerprint can be seen. In other words, the shared authorship of a collective proposal can blur voters' identification and reduce the marginal political return. Second, impositional amendments should have a more straightforward effect on the outcome analysed in this thesis as the EC86/2015¹¹ required Federal Deputies to allocate at least 50% of the impositional budgetary amendments to health (BAIÃO; COUTO; OLIVEIRA, 2020). Likewise, impositional budget amendments are of mandatory execution, which does not need to be negotiated with the executive branch. This increases the legislator's power in the payment of distributive benefits. Then, it is reasonable to expect representatives to express their political strategy more directly in this amendment.

As figure 2 shows, the impositional amendments are the most frequently proposed. According to data on the propositions of federal deputies from 2014 to 2018, this type of amendment can total about 90% of the proposed. This is what the bar plot illustrates. However, despite being the majority in number, impositional budget amendments do not receive the highest average amount. As shown in the line graph of figure 2, Federal deputies allocate a higher percentage of the pork barrel resource to the amendments that are not flagged as impositional. This result is not surprising since among the non-impositional amendments are those directed to States,

¹¹ Please refer to <http://www.planalto.gov.br/ccivil_03/constituicao/emendas/emc/emc86.htm> for more information on the EC86/2015 regarding the implementation of the impositional budget in Brazil. Accessed Jan 17th, 2023.

consortiums and State Companies – which present a higher demand for resources because they deal with situations such as public works.

Figure 2 – Frequency and average amount of impositional budget amendments (2014-2018)



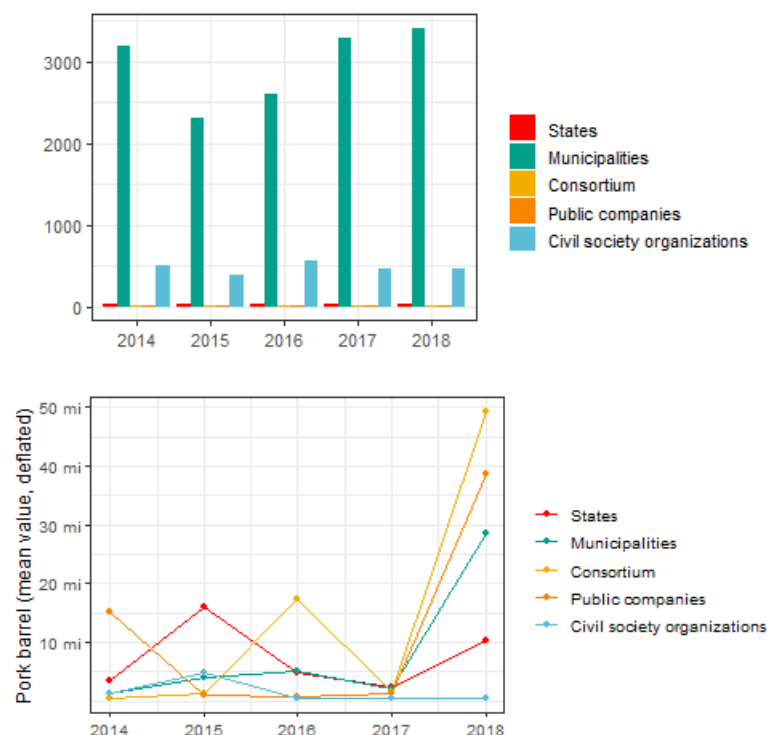
Source: The author (2023)

I also focus on budgetary amendments whose recipient is a municipality or a Civil Society Organisation. This choice also considers the possibility of credit claiming, which becomes more evident when the amendment benefits a municipality to finance projects more visible to voters – such as local road renovation or purchasing materials for hospitals and schools. However, it also relies on the electoral calculus since researchers have already documented that amendments for municipalities are those that present the highest electoral returns (BAIÃO; COUTO, 2017) and that, in the absence of an aligned mayor, the most common strategy is to bypass and directly benefit civil society organisations which can process efficiently process the benefit (BUENO, 2018).

Additionally, in Brazil, some major hospitals are philanthropic entities – such as the *Santa Casa de Misericórdia*, present in almost all federation states, the *Hospital de Amor* in São Paulo. Some of them keep a public record of the pork received, as the *Hospital Evangélico de Belo Horizonte* disclosing which Congressperson and amount directed budget amendment ¹². Despite not being the ones with the highest average value on allocation, they are the most frequent in the number of proposals, as shown in figure 3. This pattern is not necessarily contradictory. The highest average values are with consortia and public companies, which generally need

¹² "Recursos de Emendas Parlamentares - 2021". Available at: <<http://www.evangelicovv.com.br/institutional/1427-recursos-de-emendas-parlamentares-2021>>. Accessed Dec 3rd, 2023.

Figure 3 – Frequency and average value of pork barrel by type of recipient (2014-2018)



Source: The author (2023)

higher values to carry out operations that may have their credit claimed by politicians in the future. Although not at the top, municipalities appear in third place, suggesting a considerable concentration of allocated distributive resources.

City status. For testing the second hypothesis, I employ an interactive term. To do so, I have created a variable that measures the municipality status concerning the state or region to which it belongs, mainly regarding the ability to process pork monies and better benefit locations. I operationalise *city status* through a dichotomous variable that takes a value of 1 whenever the municipality has a high-complexity medical centre. Zeroes are attributed otherwise. Data are publicly available in DATASUS.

High-complex centres are medical units with UCI beds and surgical centres. These are places where complex, costly procedures with cutting-edge technology are done. It is often where oncology and transplant patients are treated, for example¹³. The data are publicly available on the IBGE Cidades¹⁴ and DATASUS¹⁵. As discussed in the previous chapter, jurisdictions with this type of establishment are the main cities in the regional area. Often concentrating demand for public policy, economy, material resources and human specialisation (SCHAL-

¹³ To see the difference between high-complex and other types of health services in the *Serviço Único de Saúde*, please refer to <<https://aps.saude.gov.br/noticia/16496>>. Accessed Jan 4th, 2022.

¹⁴ For an example, please refer to <<https://www.ibge.gov.br/cidades-e-estados/pe/olinda.html>>. Accessed Jan 4th, 2022

¹⁵ Please refer to <<https://datasus.saude.gov.br/cnes-estabelecimentos>>. Accessed Jan 4th, 2022.

TEGGER; ZEMP, 2003). Oppositely, it is unlikely that very small cities will help politicians in their quest to expand the network of beneficiaries of pork-barrel effects. Although they are the majority in Brazil, small cities lack structure in policy provision – especially in health policy. Although the majority can guarantee the implementation of essential exams or attend to a citizen with an emergency procedure in their structure, more complex exams and procedures are generally performed in bigger cities. State capitals are the ultimate ones with these features, of course. But are not the only ones.

Table 1 – Pork barrel by city status (2014-2018)

	High-complexity	No high-complexity
n	588	4,626
min	0.002	0.58
median	3.11	40.13
mean	86.38	514.73
max	9,793.04	16,934.22

Source: The author (2023)

Among the 5,214 municipalities analysed, only 1,183 municipalities have hospitals performing highly complex procedures. Still, only 588 received funds from pork barrel funds directed to municipal administration or civil society organisations, as shown in table 1. This information is not contradictory. It is in line with the idea that the provision of public services occurs following a quasi-market logic (OSTROM; TIEBOUT; WARREN, 1961; OSTROM; OSTROM, 1977), where services are provided according to demand. After all, it would not be efficient for every 5,570 municipalities to carry out all types of procedures. Concerning pork barrel policies, figure the average value received by municipalities with high-complexity centres is lower than those without – which makes the value negligible when considering their population, as shown by table 1. Although it may seem so, this is not a contradictory result. Localities with highly complex health centres are generally more populated, so the amount of pork barrel per capita received ends up being lower when compared to those cities that do not have such a service – and are consequently smaller and less populated. Especially considering that populations vary wildly even within the same state, as is the case of São Paulo, which has a capital of 12.2 million inhabitants and the municipality of Borá with only 836 inhabitants.

Fiscal dependence. To test the third empirical implication of this thesis, which asks how pork's overflowing feature behaves in lower fiscal capacity contexts, I measure the municipality's fiscal dependence in a given year. To do so, I leverage publicly available data from *Finanças do Brasil* (FINBRA) from the National Treasury Department and *Sistema de Informações Sobre Orçamentos Públicos em Saúde* (SIOPS) to combine data from local revenue and fiscal transfers received by each municipality. I operationalise fiscal dependence as the ratio of the revenue generated by the municipal government to the total intergovernmental transfers the municipality receives. More specifically, I measure the local revenue as the annual value gener-

ated by Brazilian municipalities through their collection of fees and municipal taxes. By fiscal transfers, I am considering the annual amount received by each municipality from two main fiscal transfers: *Fundo de Participação dos Municípios* (FPM) and the transfer for the *Fundo Nacional de Saúde* (FNS) – which decentralises federal resources to reduce fiscal disparities and to finance the public health service, respectively. Equation 4.3 summarises how the variable is calculated.

$$FiscDep = \frac{Municipal\ revenue}{\sum_{FPM, FNS}} \quad (4.3)$$

Fiscal disparities are a common disease among subnational unities in fiscally decentralised countries. Fiscal decentralisation gives subnational unities the responsibility to guarantee their local revenue to implement their local activities. However, the tax capacity is not evenly distributed across the territory. In Brazil, the fiscal disparity has been diagnosed for a long time (Firjan, 2015; 2021). And intergovernmental transfers are medicine often administered by the federal government (SHAH, 2006; BOADWAY; SHAH, 2007). However, the side effects tend to be fiscal dependence, as widely documented in the literature (MELO, 1996; ARRETCHE, 2010). Fiscal dependence levels in Brazil vary across states, as shown in figure 4. There also appears to be some clustering between units in the north and northeast, which consistently show a higher average fiscal disparity than subnational units in other regions. With such a gap among regions, it must be considered when analysing pork-barrel overflow as a characteristic that affects the ability to implement policies.

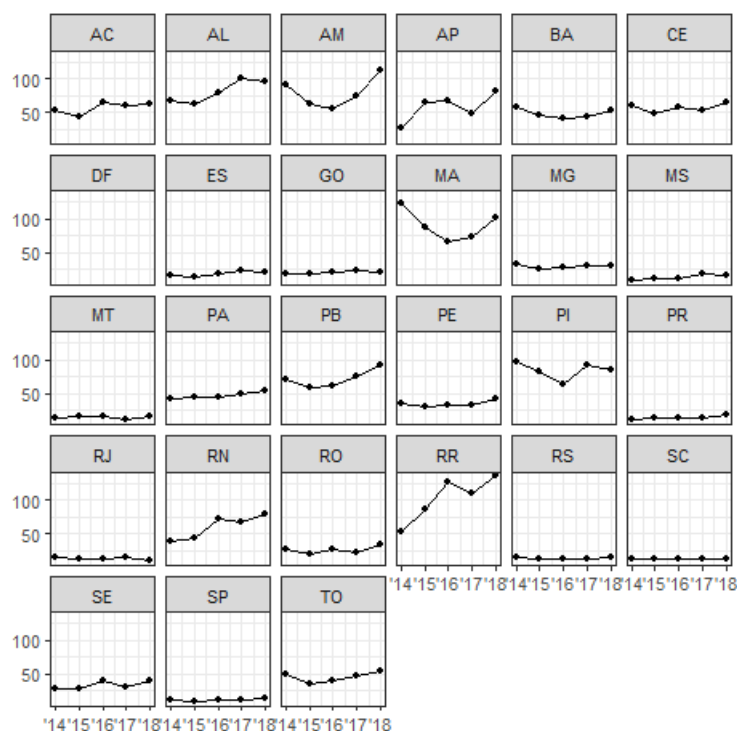
4.3.2 Dependent variables

This research tries to understand to what extent pork barrel's positive effects on policy overflows to neighbouring target areas. But while previous research focused on pork's effects only on policy outcomes (BERTHOLINI; PEREIRA; RENNO, 2018), I break this effect down into three policy indicators: input, process and outcomes. As policy provision is a complex phenomenon, the better way of estimating pork's effects is to look closely at each step.

According to Januzzi (2001, p. 23) input indicators are the ones which refer to the availability of human, financial and material resources; process indicators translate the empirical effort in allocating the resources and outcome indicators show the consequences of resource applications. Then, I measure health policy inputs as the annual amount spent on healthcare policy per capita for each municipality. Process indicators measure citizens' use of the service, and I use the Bacille Calmette-Guerin (BGC) vaccine coverage rate in the municipality. This should be a suitable proxy for using the service, as Brazil's BCG vaccine is mandatory¹⁶. In addition, during the COVID-19 pandemic, it was possible to observe that the population could

¹⁶ "Vacina BCG completa 44 anos de imunização da população brasileira contra a tuberculose". Available at: <<https://www.gov.br/saude/pt-br/assuntos/noticias/2021-1/julho/vacina-bcg-completa-44-anos-de-imunizacao-da-populacao-brasileira-contr-a-tuberculose-3#:~:text=O%20Minist%C3%A9rio%20da%20Sa%C3%BAde%2C%20por,crian%C3%A7as%2C%20juntamente%20com%20outras%20vacinas>>. Accessed in Feb 11th, 2023.

Figure 4 – Average value of dependence by state (2014-2018)



Source: The author (2023)

break through territorial blockades to get vaccinated in neighbouring cities¹⁷. Taken together, the use of BCG vaccination coverage appears to be an ideal proxy for the analysis undertaken in this thesis. Finally, outcome indicators indicate how public policy has affected citizens. I use the annual infant mortality rate for that. This indicator is an appropriate proxy for measuring health policy outcomes at the municipal level and has been used extensively in empirical research (GIRAUDY; PRIBBLE, 2020, p. 26). All data is publicly available from the Department of Informatics of the Unified Health System (DATASUS) and are available at the municipal level yearly. Table 2 presents the descriptive statistics for each variable.

Table 2 – Descriptive statistics of dependent variables (2014-2018)

Statistic	N	Mean	St. Dev.	Min	Max
Spending per inhabitant	33,161	701.6	301.5	124.8	5,984.4
BCG coverage	33,240	96.9	39.7	0.000	1,940.0
Infant mortality rate	28,227	14.5	9.1	1.3	200.0

Table 3 – Source: The author (2023)

¹⁷ "Um em cada sete brasileiros recebeu a vacina fora da cidade de residência". Available at: <<https://www.cnnbrasil.com.br/saude/um-em-cada-sete-brasileiros-recebeu-a-vacina-fora-da-cidade-de-residencia/>>. Accessed Feb 11th, 2023.

I argue that this can help to strengthen the evidence of pork's effects as it considers other processes in policy provision that may be more directly affected than outcomes alone. Such decomposition of the effect should generate an analysis result with less noise. While I expect a positive impact on all three indicators, I believe there is a more significant effect on input indicators. However, I expect pork monies will positively affect spending since the receipt of amendments releases the municipal budget and allows local administrators to spend more on healthcare (which must reach the minimum 15% provided for in the Constitution). I also expect that pork barrelling will affect process indicators as the Brazilian legislators are often directed to healthcare policies, which are more visible to the electorate and increase the credit-claiming possibilities in the future. Still, even if also indirectly, I also expect that it can affect the outcome indicators of the municipality's health policy, in line with the previous resource that shows a positive (albeit dissipative) effect of pork on policy outcomes (SORRIBAS-NAVARRO, 2011; BERTHOLINI; PEREIRA; RENNO, 2018; ARVATE; MATTOS; ROCHA, 2015; ALMEIDA, 2021).

4.3.3 Control variables

To ensure the robustness of the result, I include some control variables in the proposed models. I leverage municipal-level data from alternative explanations of the outcome variables and potential confounders to create the control set of variables. I control by the characteristics of local management that can affect the quality of policy implemented by municipalities (BATISTA, 2015; FERRAZ, 2007). Bureaucracy is one of them, and the type and quality of local bureaucracy can affect the policies of federated entities. Therefore, I add the proportion of appointees in local administration in a given year.

Further, the level of political competition in a municipality matters. It forces a good performance from the local administration and puts pressure on the investment in healthcare at the local level (BESLEY; COATE, 2003; PRIBBLE, 2015). Then, to estimate political competition, I employ the margin of victory of the local Mayor in the local election. To measure this variable, I compute the difference between the elected Mayor to the second place. In cities where the Mayor was elected in the second round, the difference considered was that of the second round. In municipalities where only one candidate was running for office, her margin of victory was her total number of valid votes.

Yet, another variable that might influence the variance of health indicators is conditional cash transfer programs, where families must ensure compliance with health and education conditionalities to guarantee receipt of the program, and the scholarship has extensively documented the effect of conditional cash transfers on health indicators (SKOUFIAS, 2001; SAWYER, 2007; FERNALD; GERTLER; NEUFELD, 2008; Hoces de la Guardia; HOJMAN; LARRAÑAGA, 2011). Brazil has one of the most extensive CCT programs, the *Programa Bolsa Família*, which also applies conditionalities regarding healthcare policies for children in benefit. So, I control

the municipality's rate of families that are beneficiaries of the *Programa Bolsa Família* during a given year.

I also control by the political alignment of the Mayor that receives the pork barrel since the presence of allied mayors affects the particular expenditure (BROLLO; NANNICINI, 2012; BROLLO et al., 2013). The variable assumes value one whenever the Mayor's party was in the Federal Government coalition and zero otherwise. I also control by the political alignment of the Mayor with the state governor, as the literature has accounted for the effects of being co-partisan of the state governor and the effects of pork barrelling (BUENO, 2018; MEIRELES, 2019). In this case, the variable assumes one when the mayor and state governor are from the same political party.

Since the literature has well documented the effect of the electoral cycle on legislators' particularistic spending (BICKERS; STEIN, 1996; GOLDEN; MIN, 2012; KANG, 2015; BAIÃO; COUTO, 2017), I control for election years at national and subnational levels. To do so, I create a dummy variable assuming value one whenever it is an election year and zeroes otherwise. I also consider context variables. To account for the economic reality of each subnational unity, I control the local Gross Domestic Product per inhabitant in a given year for each municipality. I also control by the number of seats in the Chamber of Deputies that each state has since the literature suggests that localities with a small district magnitude make the legislator understand the problems of its population as more important than the others (SHUGART; VALDINI; SUOMINEN, 2005; ANDRÉ; DEPAUW; MARTIN, 2015; TAVARES, 2018).

As state capitals hold a disproportionate amount of human and material resources, especially in smaller and poorer states, I add a dichotomous variable that takes value one whenever the municipality is a state capital. In addition, I added a dummy variable to account for the Presidential Term. This is a crucial variable, as the Dilma Rousseff and Michel Temer administrations had divergent visions of creating the public budget. For illustration, President Michel Temer approved the "*Teto de Gastos*", which was an amendment to the Constitution (EC95/2016) that limited public spending by the federal government for the next 20 years. This decision affected, in addition to other areas of public administration, budget amendments – forcing legislators to indicate an expense that would be cancelled when allocating resources from budget amendments¹⁸. Finally, I also add fixed effects by each Brazilian state – with this, I allow the model to vary its intercept to each state and account for the specificity of each state (HAIR et al., 2009).

¹⁸ For more information, please refer to <<https://www.camara.leg.br/noticias/523179-orcamento-aprova-norma-para-emenda-parlamentar-nao-pressionar-teto-de-gastos/>>. Accessed Jan 18th, 2023.

5 Results

In this chapter, I test the empirical consequences of the pork barrel's spatial spillover effects theorised in this research. As the reader remembers, I argue that the extent of the beneficiaries' network of pork barrel positive collective effects goes far beyond the target city, as spatial interdependence of jurisdictions plays an essential role in policy provision. Consequently, pork barrel policies also affect the policy of surrounding areas of the target jurisdiction. This effect should increase when the distributive resource arrives in municipalities that absorb the demand for smaller jurisdictions in a given region and provide public service to commuters-clients. This effect also interacts in contexts of fiscal dependence since distributive resources can be fundamental for implementing policies and providing public services. While all these developments jointly make pork barrel spending politically efficient, the spillover itself is insufficient to lessen the subnational disparity in public policy.

To reckon with such effects, I first analyse where pork barrel is supplied in Brazilian municipalities. While the literature has satisfactorily documented which political actors benefit from receiving the pork barrel (LIMONGI, 1994; FIGUEIREDO; LIMONG, 1999; LIMONGI; FIGUEIREDO, 2005; BROLLO; NANNICINI, 2012; BUENO, 2018; MIGNOZZETTI; CEPALUNI, 2019; MEIRELES, 2019), I focus on identifying the pattern of locations where the redistributive benefit is allocated and the existence of spatial dependence between these local units. In other words, instead of looking for which political actor, I focus on which municipalities receive the distributive monies from legislators to understand the allocation pattern employed among the Brazilian municipalities. This is the first part of the results and is essential for comprehending the overflowing feature of pork barrelling.

Then, I employ the Spatial Durbin Model regression analysis to identify if the pork barrel monies affect healthcare policy in the target municipality and to what extent it spills over to neighbouring municipalities. To do so, I implement three models that test the effects of pork barrel in the city and the surrounding area and how it interacts with the city's status and the level of fiscal dependence. Finally, I undertake a descriptive analysis of the Gini indexes on the dependent variables of health policies to identify the variation in health policy disparity within states.

Thus, this chapter is divided as follows. In the next section, I present the result of the descriptive and spatial analyses of the local units that are the target of pork barrel policies. Then, I present the analysis of the regression models. The last section closes the chapter by demonstrating the variation in subnational inequality in health policy across Brazilian states.

5.1 Following the bacon: Pork barrel policies allocation in Brazilian municipalities

We have learnt much about the political profile of who receives pork barrel monies in the National Congress (FIGUEIREDO; LIMONG, 1999; PEREIRA; MUELLER, 2003; LIMONGI; FIGUEIREDO, 2005; RAILE; PEREIRA; POWER, 2011; VASSELAI; MIGNOZZETTI, 2014) and at the subnational level (PEREIRA; RENNÓ, 2001; PEREIRA; RENNO, 2003; SILVA, 2011; KRINER; REEVES, 2015; BAIÃO; COUTO, 2017; BAIÃO; COUTO; OLIVEIRA, 2020). However, our knowledge of to *where* the pork is being allocated is still limited. Besides the scholarship signalisation, the incentives for allocating to a group of local units based on their electoral geography (AMES, 2003; CARVALHO, 2003; CARVALHO, 2009), political connections (BROLLO; NANNICINI, 2012; BUENO, 2018) or electoral ambitions (SAMUELS, 2002; CAROZZI; REPETTO, 2019), we still do not know much about the territorial allocation and the profile of municipalities. In this section, I aim to contribute to the ravelling on this matter through an exploratory and descriptive analysis of pork monies distribution.

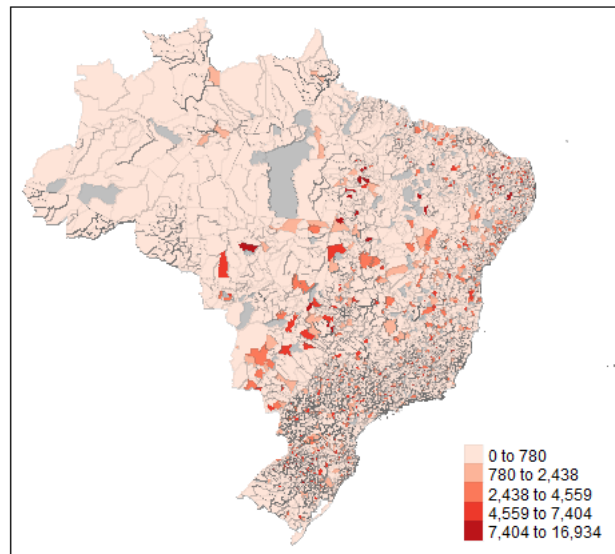
That being said, my first goal is to analyse the variation of pork monies among Brazilian subnational units. Figure 5 displays the allocation pattern of pork barrel policies in the national territory. Values are shown in Brazilian Reais (BRL) and deflated by the Consumer Price Index (IPCA) for a better comparison. The values of budget amendments are grouped into five clusters, classified by the "kmeans"¹ cluster algorithm, which is an unsupervised learning algorithm that tries to reduce variance while classifying cluster members (Rodrigues-Silveira, 2013a, p. 84). This process gathered the cases into five clusters, ranking the municipalities by the amount of per capita pork barrel resources received annually. The darkest the colour of the municipality, the greater the average per capita amount of pork barrel monies it has received.

At first glance, the figure displays a rather dispersed allocation pattern. The lighter shade of red seems to dominate Brazilian territory. Most amendments (29,739 cases) are in the first clusters, where legislators send an average value of up to 780 Brazilian reais per capita for most municipalities between 2014 and 2018. The second cluster only includes 1,569 amendments, where congresspeople disbursed between 780 and 2,438 Brazilian reais. The third cluster keeps 1,084 cases, targeting an average value of pork barrel funds varying from 2,38 to 4,449. The fourth cluster retains 674 budgetary amendments, where between 4,559 and 7,404 amendments per capita were allocated. Lastly, only 174 amendments allocated the largest amount to municipalities, ranging from 7,404 Brazilian reais per inhabitant. This result is particularly interesting as it corroborates a recurrent result in analyses of distributive policy in Brazil – mainly budget amendments – which generally point to political-electoral aspects that generate incentives for the concentration of budget amendments in one or a few municipalities.

Figures 6 zooms into each Brazilian State to show the variation among municipalities from 2014 to 2018. The distribution seems to be more equal, with a lower level of pork distributed in Amapá, Rondônia and Roraima, where the light red appears more confidently. Similarly to

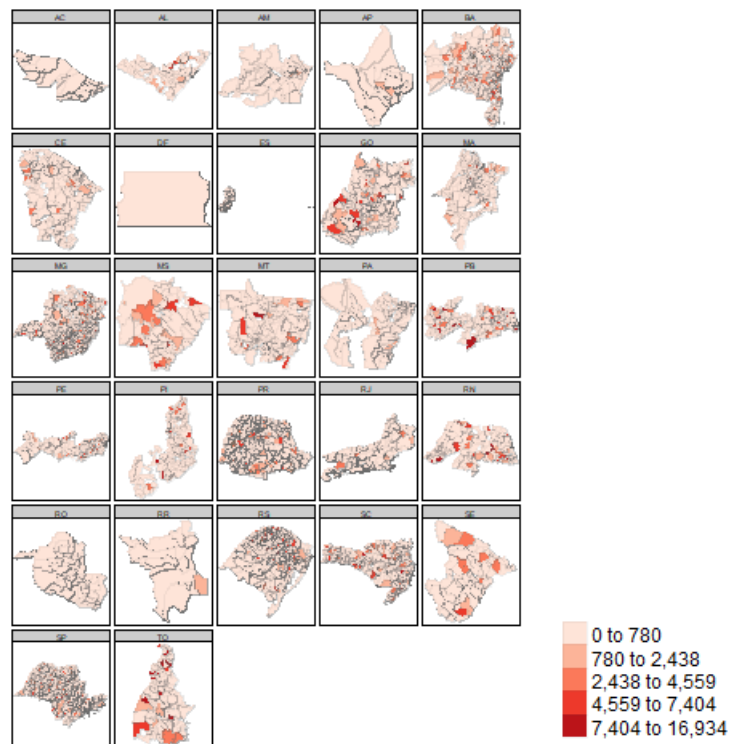
¹ To do so, I used the ClassIntervals R package.

Figure 5 – Per capita value of impositional budgetary amendments received by municipalities (2014-2020)



Source: The author (2023)

Figure 6 – Per capita value of impositional budgetary amendments by State (2014-2020)

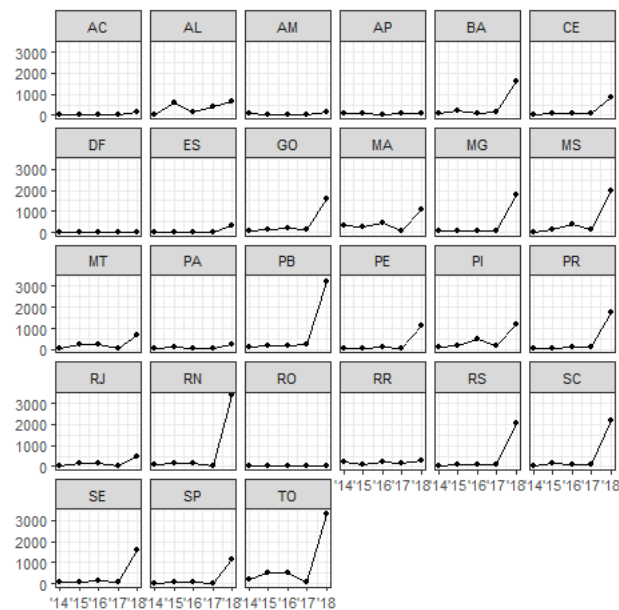


Source: The author (2023)

results from the national territory map, figure 6 also suggests a diffusion of pork barrel funds within municipalities in every Brazilian state – with a few concentration spots. Figure 7 helps

to assess the temporal variation by presenting the change over time in pork delivery by showing the mean value of pork barrel monies as a percentage of the population from 2014 to 2018. Something that stands out is the peak in 2018 of the average pork value in at least 20 Brazilian states. This might reinforce the electoral connection aspect of distributive politics since the national elections took place in October 2018. Although this information is insufficient to argue spatial spillover effects, it indicates a clear allocation pattern among subnational units, where legislators deliver smaller amounts of budget amendments to most municipalities within electoral districts but sends concentrated funding to a handful of municipalities. Part of the puzzle of this thesis is related to discovering to where this resource is allocated.

Figure 7 – Pork barrel as a percentage of population by state from 2014 to 2020



Source: The author (2023)

Altogether, these results suggest a dispersion pattern of allocation of the pork barrel resource. To confirm this suspicion, I performed a spatial auto-correlation test on pork barrel data in Brazilian municipalities. The visually identified pattern remains as Moran I = 0,03 with a significant association (p-value <0,00) and negative expected values (expect = -0,03) – indicating that there is spatial auto-correlation, with neighbouring municipalities having dissimilar pork per capita average values. But the global Moran I is only a summary of the relationship of each location at the point of time analysed (ANSELIN, 1995). I employ a Local Moran I analysis to understand how each municipality relates to its neighbouring. It will help identify the localities where pork barrel spending is deviant from the global dispersion informed by Moran I. Additionally, It will produce the Local Indicator of Spatial Association (LISA) to observe how the local units distribute themselves.

Table 5.1 shows the LISA quadrants, considering as the first quadrant those municipalities receiving higher values of pork and the surrounding localities as well (high-high). The second

quadrant keeps the municipalities where a lower level of pork barrel is being received but surrounded by neighbours receiving a bigger share. On the other hand, the third quadrant keeps the localities where they receive little pork barrels and are surrounded by municipalities that also do. Lastly, the fourth quadrant has municipalities with a high amount of pork barrel policies surrounded by municipalities that receive fewer pork barrel funds. Among the 33,240 budget amendments analysed, 23,643 did not present significance on local spatial association ². Considering those who showed a significant relationship, 850 cases appeared in the first quadrant, 5,786 in the second, 700 in the third and 2,261 in the last quadrant.

Figure 8 projects the LISA clusters on the map of Brazil and its municipalities. As we can see, most of the map is white, representing the absence of statistical significance in the spatial relationship between municipalities. However, some clusters are apparent. The blue spots appear throughout the whole territory, both representing clusters. The darker blue is clusters of low levels of pork barrel funds when the city and its neighbours receive little pork monies. On the other hand, the lighter shade portrays a low outlier: when cities receiving little pork are among the ones receiving high amounts of pork barrel policies per capita. Red represents those who receive a higher pork level and are surrounded by a similar level. Orange shows municipalities that have high levels of pork per capita but whose neighbours have lower.

Table 4 – Quadrants of LISA analysis

		Pork per capita	
		Low	High
Lagged pork	High	Quadrant 2	Quadrant 1
	Low	Quadrant 3	Quadrant 4

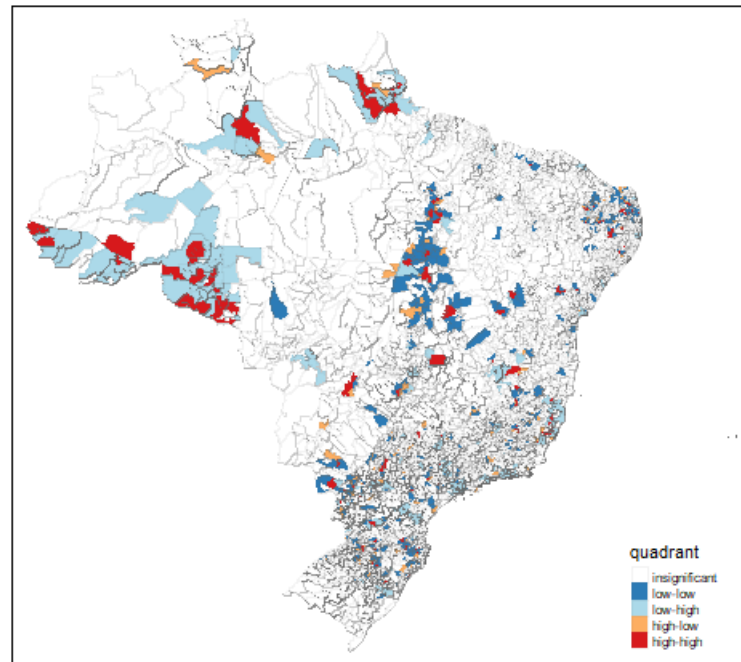
per Source: The author (2023)
capita

First quadrant: positive auto-correlation and clustering

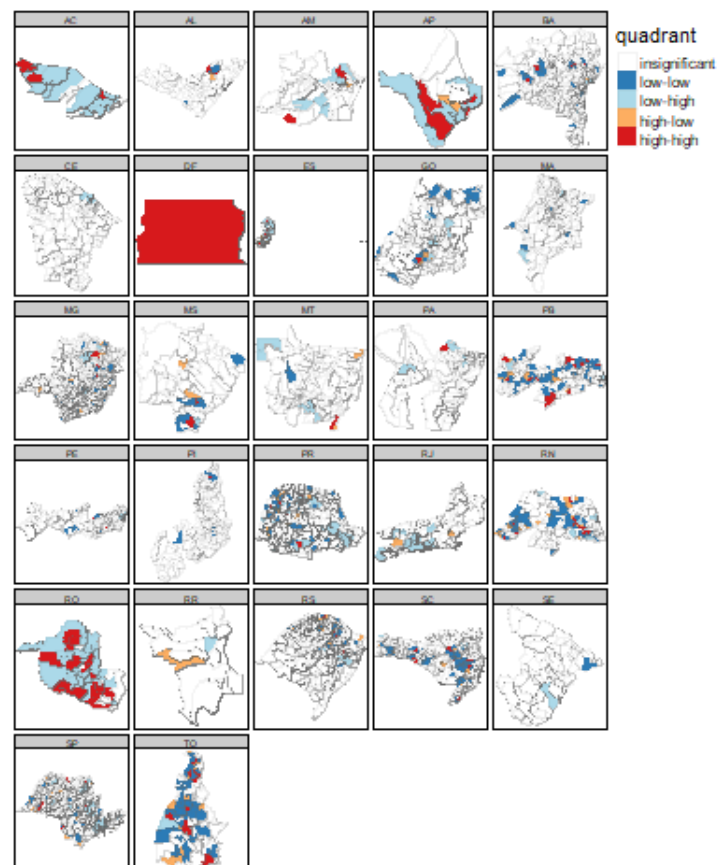
The red dots in figure 8 represent the first quadrant. It displays clusters of municipalities targeted with high pork-barrel monies via budget amendments. Over the five years analysed, it mainly tackles small municipalities with no more than 20 thousand inhabitants in South and Northeastern Brazil. The majority of the cases are in Northern Brazil. Some features of this region may trigger legislators to adopt this type of distribution: first, the small number of municipalities enables the greater targeting of resources to a single unit. Second, they are over-represented states in the Chamber of Deputies³. So, each of these states has eight representatives, with access to the same 25 budget amendments as their peers representing more populous states. Consequently, the proportion of pork per capita tends to be higher in this region.

² Following Hair et al. (2009), I have removed all outliers that were three standard deviations from the mean from the analysis. Please refer to the annexes for descriptive statistics of these outliers.

³ According to article 2 of Complementary Law 78/1993, "None of the member states of the Federation will have less than eight federal deputies". Thus, less populous states have a fixed number of 8 Federal Deputies. For more information, see: <http://www.planalto.gov.br/ccivil_03/leis/lcp/lcp78.htm>. Access. 04 July, 2022.



(a) National



(b) State-level

Figure 8 – Local indicators of spatial association clusters (2014-2018)

Source: The author (2023)

The prevalence of this allocation pattern occurs among legislators of the state of Rondônia with 149 amendments, followed by Paraná with 108 and Acre with 97 occurrences. Legislators targeted 360 municipalities while applying this distribution strategy during the studied period. The average pork barrel per capita received was 2,175 reais per inhabitant, with a minimum of 0.12 inhabitant and a maximum of 16,881 Brazilian reais per inhabitant. The average GDP per capita in the cluster is 24,214 Brazilian Reais per capita, and the municipalities have up to 20,000 inhabitants.

Second quadrant: positive autocorrelation and negative outlier

Light blue is the spot displaying the second quadrant in figure 8, the most common allocation pattern among Brazilian legislators in the period studied. In this strategy, legislators distribute budget amendments of lesser value among municipalities in a district that are neighbours of municipalities that concentrate a greater amount of redistributive funds. In other words, they allocate little pork to the majority of the municipalities while concentrating the biggest share of their pork money in a few jurisdictions – while keeping it in the neighbourhood.

This is the most common resource allocation strategy for pork barrel policies among Brazilian legislators from 2014 to 2018. The interesting point is that it empirically proves the indications of the literature on the concentration incentives that the electoral system and the legislative and electoral (SAMUELS, 2000; DENEMARK, 2000; AMES, 2003; BOAS; HIDALGO; RICHARDSON, 2014; MOSCOVICH; BRUSCO, 2018; MATTOS; POLITI; MORATA, 2020; HANRETTY, 2021) arena create in the Brazilian congressman. Although this analysis is insufficient to identify the explanatory primacy – besides going beyond the scope of this work –, it clearly demonstrates the dominant strategy in sending pork to municipalities. Although the light blue dots appear well dispersed on the Brazilian territory map, this cluster predominantly encompassed Southeastern and Southern populous municipalities, mostly with more than 500 thousand inhabitants. This allocation strategy was more predominant in representatives from São Paulo (1,346), Paraná (1,066), and Rio de Janeiro (441) were the states where budget amendments followed this distribution pattern more frequently. This is also where there is the highest concentration of state capitals. At least 19 capitals appeared in this cluster between the years 2014 to 2018, but representatives who used this strategy the most were from São Paulo (431), Belo Horizonte (238) and Recife (154).

It is reasonable that cases in this quadrant have high outliers in clusters of municipalities that receive high levels of pork monies. In addition to the high population average in this cluster, politicians applying this allocation strategy represent states with the highest number of representatives in the lower chamber. São Paulo, for example, has 80 representatives. Rio de Janeiro, 40 Deputies, Paraná another 30 and Pernambuco 27. In this sense, considering each of them has access to the 25 budget amendments, the flow of resources is more outstanding and rather dispersed – while they have to feed different electorates in several parts of the district, trying

to avoid competition. Also, this cluster unsurprisingly has a higher average GDP of 39,274.93 per inhabitant and a lower level of fiscal dependence (10.21) since it is concentrated in one of the country's wealthiest regions.

Third quadrant: positive autocorrelation and negative cluster

The dark blue areas in figure 8 show the local units receiving low levels of pork barrel policies per inhabitant in a similarly low neighbourhood. These municipalities are largely in Brazil's Southern and Southeastern areas, with 261 and 210 amendments allocated in this manner, respectively. There are 410 local units, predominantly sparsely populated, with most cases being in municipalities with up to 10,000 inhabitants. Representatives of Rio Grande do Sul and Paraná are the fondest of this type of allocation, with 101 and 214 budget amendments following this allocation pattern, respectively.

This is the least typical allocation pattern among Brazilian legislators. Most likely, they allocate a small number of resources to municipalities where they wish to acquire votes but whose number of votes is not necessarily sufficient (or decisive) for their victory at the polls. Because they are small municipalities, the electoral weight would be low. Even if the legislator were dominant in this cluster's districts, it would still be more rational to allocate resources dispersed to guarantee the construction of her electorate. Concerning the characteristics of the municipalities that receive lower amounts from deputies, the average pork barrel per capita allocated to each municipality is 482 Brazilian reais per inhabitant. The average GDP value is 26,082.26 Brazilian Reais, the level of fiscal dependence is relatively high, and the average population is 26,091.24.

Fourth quadrant: negative autocorrelation and positive outlier

Orange clusters in figure 8 represent the cases where legislators benefit neighbours of cities that receive a high pork barrel value with fewer distributive monies. In other words, congress-people concentrate on higher-value budget amendments in some cities while allocating lower-value amendments to neighbours. The orange clusters are spread across the national territory. These cases are complementary to the second quadrant. Here, we can see which municipalities that receive the most outstanding amount of distributive resources concentrated among the neighbours that receive budget amendments of lesser value.

Medium-sized municipalities seem to be predominant in this type of allocation since 1,157 budget amendments were allocated to municipalities with populations between 10 thousand and 50 thousand inhabitants. Also, this strategy was primarily employed by representatives from the Southern and the Northeastern areas, with 935 and 554 budget amendments each. At least 655 municipalities benefited from this allocation strategy. Among them, receiving an average of 87.82 Brazilian reais per inhabitant through distributive resources. An average GDP per capita of 24,954.01 demonstrates that most cities are not very economically developed, which corroborates the dependence on fiscal resources of 36.84 concerning health resources – also, an average population of 26,608 inhabitants.

This configuration is probably where the overflowing feature of pork barrel monies will show the most. The dynamic represented by this allocation pattern is fairly similar to the one I theorised in chapter 3. Legislators send high-value pork barrel monies to some municipalities and lower-level monies to their neighbouring. Despite being an exciting result and indicating the existence of the allocation mechanism that supports this thesis's central claim, the LISA clusters' analysis is insufficient to indicate the overflow dynamics of the positive effects of the pork barrel. To do so, I implement a spatial regression analysis of the Spatial Durbin model to identify the primary and secondary effects of the pork barrel on local public policies. That's what the next section is about.

5.2 Porking around: Assessing pork barrel policies' spatial spillovers

After understanding how resources are allocated among municipalities, based on the strategy adopted by legislators and the consequent allocating clusters formed, I now undertake a spatial analysis to identify the spillover effects of pork-barrel policies on public health policy in municipalities Brazilians between 2014 and 2018. To this end, I analyse the effects of the per capita value of pork barrel funds received by municipalities on three health policy indicators. I analyse to what extent the effects spill over to neighbouring municipalities and how this relationship occurs when they face different contexts of city status (referring to the level of complexity of the hospital centre's existence) and the municipality's financial dependence level.

According to results from the previous subsection, most congresspeople deliver the highest share of their pork barrel monies to one or a few municipalities while allocating smaller grants to their neighbouring cities. In this thesis, I argue that legislators do not randomly employ such a strategy. Instead, they have incentives to give the highest share of pork monies to municipalities where residents from neighbouring jurisdictions can access such benefits, aiming to gather electoral support by increasing the network of pork's collective effects beneficiaries. Table 5 shows the Spatial Durbin Model (SDM) results that test this hypothesis. In this thesis, I use the SDM to assess whether variation in health policy indicators due to the receipt of pork barrel grants in a local unit relates to the traits of its neighbouring areas. However, the interpretation of SDM regressions cannot be performed in the same way as with Ordinary Least Squares models, for example. In this case, since I am interested in the spillover effects, it is necessary to consider the direct and indirect effects of the variables. According to (GOLGHER; VOSS, 2016), the direct effect presents the expected average change in the dependent variable for the observations of a region given the increase of one unit in the explanatory variable of that region. On the other hand, the indirect effect represents the change in the dependent variable of a region when there is an increase of one unit in the explanatory variable of another region. For the purposes of the analyses that I carry out in this thesis, "region" is understood as a municipality.

Table 5 presents three models. The first of them takes into account the input indicator; the second considers the process indicator, and the last one the outcome indicator as dependent variables. The first model shows the effects of pork barrel monies on the input indicator, measured

by the annual per capita spending on healthcare policy. The result suggests that all conditions being equal, pork barrel positively and significantly affects the city's health care expenditure. Although positive, pork barrel monies effects are minor compared to other covariates such as local health indicators, local GDP per capita or the proportion of political appointees – which boosted the local spending in healthcare. This is an expected result, as distributive policies are a smallish share of local funding. But albeit small, my main claim in this thesis is that pork monies' effects manage to spill over to the neighbouring municipalities. To understand if this happens, we should not look only at the coefficients but at the impacts of the desegregated impacts of variables.

Table 6 presents the variables' effects on the targeted unit (direct), the variables' effects on neighbouring units (indirect) and their total effect (sum of the direct and indirect impact). In other words, this allows us to observe to what extent the coefficient presented in table 5 is distributed among the unit analysed and how much of it spills over to neighbouring units. In the first model, pork barrel monies directly affect 0.004 health expenditure. This means that with 1 real per capita increase in the pork barrel resource received by the municipality, the local government's health spending does not even sum up to a meaningful value. Since these effects are very small, allow me to scale up. Instead, let's consider an increase of 100 Brazilian reais per capita in the amount of pork barrel policies the municipality receives. Then, there is an increase of 0,40 Brazilian reais in health spending. While interesting, that is the direct effect of pork barrel transfers on the targeted municipality's spending. In particular, I am interested in the indirect effects of this resource. When we look at the spillover effects across municipalities (indirect effect), we note that the increase of 100 Brazilian reais per capita in the pork barrel resource received by the targeted municipality causes its neighbours to increase their jurisdictions' health spending by 0,70 Brazilian reais – if the value of its own pork barrel monies stays the same. In other words, when a municipality receives one hundred reais of pork barrel resources, its own spending on health increases on average by 0.40 cents while the neighbouring municipality increases its spending by 0.70 Brazilian real cents.

This result is especially interesting because it demonstrates to what extent the effect of pork barrel policies was underestimated when not considering spillover effects. In summary, in addition to affecting health spending in the targeted municipality, the receipt of pork barrel policies also triggers spending in neighbouring municipalities. Although mine is just enough to signal the existence of a spatial dynamic that generates health policy spillover effects, a classic explanation from the literature is yardstick competition. Considering the market, this theory considers companies that choose efficient costs for their products but, when faced with other companies, end up regulating each other (SHEFTER, 1994). Regarding the electoral sphere, where voters influence the policy choices of local incumbents. More specifically, comparing municipalities' provision of public goods (and taxation) forces local managers to consider what neighbouring jurisdictions are doing Besley e Case (1992) and Anselin (1995).

Model two shows the results for the process indicator, measured by the BCG vaccine coverage for each municipality yearly. In this case, the pork barrel fund's coefficient is positive and significant, albeit small. In other words, the pork barrel's positive effect on the indicator represents the municipality's citizens' use of health policy services. Again, although other variables seem to matter more to the variation in BCG vaccination coverage among children, pork barrel policies also appear to matter. When we look at indirect impacts, we can see that pork barrel resources matter as much to the municipalities targeted by legislators as they do to their neighbours. Using the same scale as suggested in the previous model, when we increase the per capita value of pork barrels received by the municipality by 100 reais, there is an 0,02 Brazilian reais increase in BCG vaccine coverage among children, but also a 0,01 increase in BCG vaccine coverage among children from neighbouring municipalities – when their pork barrel resource is kept the same. Albeit small, this demonstrates how the effect of the pork barrel policy spills over in terms of health policy utilization indicators.

Model three proceeds similarly with outcome indicators, measured as the infant mortality rate for each municipality in a given year. The results suggest that pork barrel has a positive and very weak, although insignificant, influence on the local infant mortality rate. This result is interesting as it goes opposite to Bertholini, Pereira e Renno (2018)'s findings. The authors identified that receiving pork barrel monies for one year of budget amendments decreases the average infant mortality rate by 13.7% and for two years by almost 8%. While Bertholini, Pereira e Renno (2018) and his co-authors analyse the Brazilian municipalities that received budget amendments between the years 1999 and 2010, they disregard the differences between the types of budget amendments and consider them unrestricted. On the other hand, in my empirical strategy, I decided to analyse individual impositonal amendments, which only started in 2014. In addition, this period comprises the time when the infant mortality rate in Brazil was more controlled, having decreased by about 20% compared with the period analysed by the authors⁴, where any variation in the infant mortality rate would be more minor in magnitude. Despite the lack of significance, my findings imply that when considering spatial interdependence in the analysis, the pork barrel monies matter for the financing of health policy but have no significant influence on process and outcome indicators.

Table 5 – Spillover effects of pork barrel policies on health policy in Brazilian municipalities (2014-2018)

	<i>Dependent variable:</i>		
	Spending	BCG Coverage	Infant Mortality
	(1)	(2)	(3)
Pork per capita	0.005***	0.0002*	0.00000

⁴ Please, refer to <<https://g1.globo.com/bemestar/noticia/2013/09/no-brasil-taxa-de-mortalidade-infantil-cai-75-desde-1990-aponta-onu.html>>. Accessed at 19th, Jan 2023.

	(0.001)	(0.0001)	(0.00003)
Fiscal dependence	0.445***	−0.023**	0.001
	(0.060)	(0.011)	(0.003)
High complexity	28.536***	11.728***	2.431***
	(6.952)	(1.323)	(0.299)
Political appointees (share)	354.135***	7.762	3.840***
	(33.272)	(6.327)	(1.425)
PBF beneficiaries (rate)	−0.002***	0.00004	0.0001***
	(0.0003)	(0.0001)	(0.00001)
National government Coalition	10.632**	1.028	−0.021
	(4.448)	(0.847)	(0.190)
Local government coalition	−0.211	1.767*	−0.288
	(5.468)	(1.041)	(0.233)
National election	28.820***	2.384***	−0.655***
	(4.765)	(0.907)	(0.203)
Local election	74.078***	−10.114***	−0.693**
	(6.526)	(1.242)	(0.280)
Margin of Victory (Mayor)	0.0003***	−0.00003*	−0.00001
	(0.0001)	(0.00002)	(0.00000)
Seats (Federal Deputies)	3.444***	0.015	−0.043**
	(0.418)	(0.078)	(0.018)
Michel Temer (dummy)	115.553***	−2.332**	−1.027***
	(4.828)	(0.919)	(0.210)
State capital	276.057***	7.478	3.313***
	(25.779)	(4.903)	(1.103)
GDP per capita (log)	−3.817*	2.501***	−3.472***
	(2.313)	(0.442)	(0.102)
Spending per capita	-	-	0.008***
			(0.0004)
BCG Vaccine coverage	-	-	−0.008***
			(0.002)
States (FE)	Yes	Yes	Yes
Constant	31.791	3.173	80.578***
	(54.084)	(10.274)	(2.443)
Observations	11,430	11,430	11,430
Log Likelihood	−78,155.230	−59,056.720	−41,913.490
σ^2	49,250.560	1,784.872	89.518
Akaike Inf. Crit.	156,390.500	118,193.400	83,910.970
Wald Test (df = 1)	1,975.173***	314.905***	61.839***

LR Test (df = 1) 1,614.195*** 299.452*** 58.018***

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 6 – Direct and indirect impacts of spatial spillover effects

	1			2			3		
	DE	ID	TE	DE	ID	TE	DE	ID	TE
Pork per capita	0.004	0.007	0.012	0.000	0.000	0.000	0.000	0.000	0.000
Fiscal dependence	0.463	0.674	11382	-0.02	-0.01	-0.03	0.001	0.000	0.001
High complexity	29700	43230	72931	11838	59362	17774	24350	0.438	28738
Political appointees	36858	53648	90506	78347	39285	11763	38459	0.693	45390
PBF beneficiaries (rate)	-0.00	-0.00	-0.00	0.000	0.000	0.000	0.000	0.000	0.000
National government coalition	11065	16106	27172	10374	0.520	15576	-0.02	-0.00	-0.02
Local government coalition	-0.21	-0.31	-0.53	17833	0.894	26775	-0.28	-0.05	-0.34
National election	29996	43660	73656	24067	12067	36135	-0.65	-0.11	-0.77
Local election	77100	11222	18932	-1020	-5119	-1532	-0.69	-0.12	-0.81
Margin of victory (Mayor)	0.000	0.000	0.000	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
Seats	35846	52175	88022	0.015	0.007	0.022	-0.04	-0.00	-0.05
Michel Temer (Dummy)	12026	17505	29532	-2353	-1180	-3533	-1028	-0.18	-1213
State capital	28732	41820	70552	75483	37849	11333	33187	0.598	39167
GDP (log)	-3972	-5781	-9753	25250	12661	37911	-3478	-0.62	-4104
Spending per capita							0.008	0.001	0.009
BCG vaccine coverage							-0.00	-0.00	-0.00

Source: The author (2023)

Regional and subnational disparities are a reality in Latin American countries (FARIA; SANTANA, 2014; LUNA; SOIFER, 2017; GIRAUDY; PRIBBLE, 2019; Otero-Bahamon, 2019), especially concerning health policy (GIRAUDY; PRIBBLE, 2020; Otero-Bahamon, 2019). There is no reason to think that Brazil would be different. On the contrary, given its territorial extension, its immense number of local units and the responsibility of the municipalities in providing basic health services, it is more than expected that there is subnational variation. For this reason, I seek to identify how the spillover effect of the pork barrel behaves when considering the subnational contexts. To do so, I will consider two main situations — first, the existence of a health centre where it is possible to perform more complex procedures. Following, I account for the fiscal dependency conditions of subnational units.

In table 7, three models display the effect of the pork barrel on spending per inhabitant, on the BCG Coverage rate and the infant mortality rate in the municipalities when considering the existence of a high-complexity health centre. According to the reasoning developed in this thesis, the jurisdiction with this type of configuration would have two critical factors to provide spatial spillover effects – because they are municipalities that concentrate the demand for health policy, which allows residents of neighbouring cities to come and use such services, which makes geographic and political barriers more permeable. In addition, it would be a proxy for holding human and material resources, allowing better pork-barrel money processing and further credit claiming by Congresspeople. To test this claim, I interact the pork barrel per

capita received by each municipality with the city status, which measures the existence of high-complexity health centres in the Spatial Durbin Model to understand its effects on the target and neighbouring areas.

Model 4 displays the effects of pork barrel grants on the per capita spending on health-care when the municipality has a high-complexity health centre. These findings are intriguing. It shows a positive and statistically significant effect of pork barrel policies on average local healthcare spending and the same for when the municipality has a high-complexity centre. These effects also spill over to neighbouring municipalities. To put it into numbers, using the same 100 Brazilian Reais increase in pork barrel grants received by the municipality, the target city increases its spending on healthcare policy by 1,10 Brazilian Reais. Similarly, the neighbouring jurisdiction increases its spending by 1,60 Brazilian Reais, keeping the amount received by it constant. On the other hand, when a municipality has a health centre that performs high-complexity procedures, it increases the spending by 2.40 Brazilian Reais while the neighbouring jurisdictions increase it by 0.43. Still, these effects change in the presence of a high-complexity healthcare centre. The average spending per inhabitant decreases by 0,02 Brazilian reais in the target municipality when it has a high-complexity centre. This effect is even more outstanding in neighbouring areas: the spending per capita decreases by 0,04 Brazilian Reais.

This result may seem puzzling, but it might suggest two different dynamics that can be related to the type of grants sent by parliamentarians. We know that several hospitals receive budget amendments with a specific function to finance the purchase of materials – since this does not happen unilaterally. On the contrary, it is common for representatives to be aware of the needs of these hospitals, either through their brokers or through representatives of the centre itself. In the target jurisdictions, pork monies might alleviate the burden of local government spending on health policy – as the budgetary amendments are sent with a very specified destination. On the other hand, neighbouring municipalities historically receive fewer pork barrel funds, which can generate a "lazy effect" once its amendments are sent to buy more basic equipment or ambulances to transport their citizens to cities with a hospital absorbing their demand, leading to a race to the bottom (BRUECKNER, 2000; ERMINI; SANTOLINI, 2010). When a jurisdiction becomes the main provider of public services, and these benefits spill over to commuters that have access to local services and goods provided by that jurisdiction, there is no greater need for the surrounding areas to increase their spending on these matters (LÓPEZ; MARTÍNEZ-ORTIZ; CEGARRA-NAVARRO, 2017). In the last instance, when neighbouring areas can quickly drop off their citizens to free-ride (OSTROM; OSTROM, 1977; OSTROM, 1990) the bigger city's service with the greatest potential for providing a complex public service, it may be less concerned with spending its own resources on public health and seek to invest in other areas.

The fifth model in my analysis looks at pork monies' effects on each municipality's policy process indicators. This evidence indicates pork monies' positive and insignificant effect on the BCG vaccine coverage. On the other hand, the high-complexity centre seems to positively affect

the usage of healthcare policy at the municipal level. When we observe that the effect of the pork barrel on BCG vaccine coverage among children in a municipality when it has a health centre that performs high-complexity procedures is positive and significant. In other words, although not significant in its pure effect, when the pork barrel grants are allocated to a municipality with a large hospital, it exerts a positive and significant effect on the process indicator. According to data in table 8, this also spills over to neighbouring jurisdictions. There is an increase of 0.5 in BCG vaccination coverage among children in the pork barrel municipality, where there is a high-complexity hospital, whenever there is an increase of 100 reais per capita in the amount received annually. This value is 0.5 in neighbouring municipalities when the pork barrel transfers received by them remain unchanged. This shows that in the presence of a high-complexity hospital, pork barrel policies increase the indicators of public policy utilisation by citizens. This may happen due to the greater reach that this health facility can guarantee to citizens or due to the use of the service by commuters from neighbouring cities.

Lastly, the sixth model shows the effects of pork barreling on policy outcomes, measured by the infant mortality rate in the presence of a high-complexity hospital in target and surrounding municipalities. The results imply that pork monies increase Brazilian municipalities' average infant mortality rate, despite the lack of statistical significance. But in the presence of a high-complexity health centre, the average effect of pork grants becomes negative – suggesting that it decreases the infant mortality rate even in a small magnitude. Yet, the effect that spills over to neighbouring municipalities is very small. In this way, the result converges with the scholarship that shows that in a high-complexity hospital, pork barreling does help municipalities fight the infant mortality rate in particular and produce collective effects on policy outcomes in general. In any case, the result indicates that the highly complex variable captures some characteristics of the municipality that differ from its neighbours. Municipalities with such a hospital structure tend to be larger, which may influence this result – when we analyze the disaggregated effect between the municipalities with valves and their neighbours.

Table 7 – Pork barrel spatial spillover effects and high complexity health centres

	<i>Dependent variable:</i>		
	Spending	BCG Coverage	Infant Mortality
	(4)	(5)	(6)
Pork per capita	0.011*** (0.002)	0.001 (0.0004)	0.00005 (0.0001)
High complexity	23.919*** (7.113)	12.659*** (1.351)	2.291*** (0.305)
Pork per capita*High complexity	−0.028*** (0.009)	0.005*** (0.002)	−0.001** (0.0004)
Fiscal dependence	0.447***	−0.023**	0.001

	(0.060)	(0.011)	(0.003)
Political appointees (share)	350.854***	7.582	3.842***
	(33.307)	(6.323)	(1.424)
PBF beneficiaries (rate)	−0.002***	0.00003	0.0001***
	(0.0003)	(0.0001)	(0.00001)
National government Coalition	10.733**	1.041	−0.022
	(4.453)	(0.846)	(0.190)
Local government coalition	−0.258	1.756*	−0.285
	(5.475)	(1.041)	(0.233)
National election	33.150***	3.140***	−0.726***
	(4.721)	(0.897)	(0.201)
Local election	76.624***	−9.675***	−0.733***
	(6.518)	(1.239)	(0.280)
Margin of Victory (Mayor)	0.0003***	−0.00003*	−0.00001
	(0.0001)	(0.00002)	(0.00000)
Seats	3.357***	0.009	−0.043**
	(0.419)	(0.078)	(0.018)
Michel Temer (dummy)	120.265***	−1.550*	−1.097***
	(4.770)	(0.907)	(0.208)
State capital	276.744***	8.069*	3.241***
	(25.816)	(4.901)	(1.103)
GDP (log)	−3.963*	2.640***	−3.484***
	(2.331)	(0.445)	(0.103)
Spending per capita			0.008***
			(0.0004)
BCG Vaccine coverage			−0.008***
			(0.002)
States (FE)	Yes	Yes	Yes
Constant	40.017	0.045	80.889***
	(54.387)	(10.317)	(2.453)
Observations	11,430	11,430	11,430
Log Likelihood	−78,167.490	−59,050.520	−41,911.040
σ^2	49,357.070	1,782.924	89.480
Akaike Inf. Crit.	156,417.000	118,183.000	83,908.090
Wald Test (df = 1)	1,969.800***	314.985***	61.856***
LR Test (df = 1)	1,610.961***	299.908***	58.067***

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 8 – Spatial spillover effects with high complexity health centre

	4			5			6		
	DE	IE	TE	DE	IE	TE	DE	IE	TE
Pork per capita	0.011	0.016	0.027	0.000	0.000	0.000	0.000	0.000	0.000
High complexity	2.4894	3.6217	6.1111	1.2778	6.4113	1.9190	2.2946	0.413	27083
Pork per capita*High Complexity	-0.02	-0.04	-0.07	0.005	0.002	0.007	-0.00	-0.00	-0.00
Fiscal dependence	0.465	0.677	11425	-0.02	-0.01	-0.03	0.001	0.000	0.001
Political appointees	36516	53126	89642	76537	38400	11493	38487	0.693	45426
PBF beneficiaries (rate)	-0.00	-0.00	-0.00	0.000	0.000	0.000	0.000	0.000	0.000
National government coalition	11170	16251	27422	10504	0.527	15774	-0.02	-0.00	-0.02
Local government coalition	-0.26	-0.39	-0.65	17730	0.889	26625	-0.28	-0.05	-0.33
National election	34502	50196	84698	31696	15902	47598	-0.72	-0.13	-0.85
Local election	79748	11602	19577	-9766	-4900	-1466	-0.73	-0.13	-0.86
Margin of victory (Mayor)	0.000	0.000	0.000	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
Seats	34941	50835	85777	0.008	0.004	0.013	-0.04	-0.00	-0.05
Michel Temer (Dummy)	12516	18210	30727	-1564	-0.78	-2349	-1098	-0.19	-1296
State capital	28802	41904	70707	81447	40864	12231	32459	0.585	38312
GDP (log)	-4124	-6001	-1012	26652	13372	40024	-3489	-0.62	-4119
Spending per capita							0.008	0.001	0.009
BCG vaccine coverage							-0.00	-0.00	-0.00

Source: The author (2023)

In addition to having a high-complexity healthcare centre, another critical feature that matters for the effect of pork barrel funds on subnational policy provision is the jurisdiction's level of fiscal dependence. Fiscally decentralised countries implement a tax collection structure where the federal government forgoes part of the taxes which subnational governments will collect. In this scenario, fiscal decentralisation gives federal units autonomy regarding the taxation of citizens within their jurisdiction. This increases the possibility of better management of public resources. However, a common side effect of this type of decentralisation is horizontal disparities since the taxing capacity is not homogeneously distributed throughout the national territory (DESAI; FREINKMAN; GOLDBERG, 2005). A widespread solution is the delivery of intergovernmental transfers to narrow the disparities (SHAH, 2006; BOADWAY; SHAH, 2007). However, transferring resources without strengthening revenues leads to the perverse effect of fiscal dependence (MELO, 1996). Something similar can happen with pork barrel resources, ultimately discretionary intergovernmental transfers. This should be especially true for Brazil, as the country has decentralised two of the most critical policies to the subnational level: healthcare and education, while not decentralising the most important taxes (ARRETCHE, 2010; ARRETCHE, 2012). Thus, allocating pork barrel resources has different meanings for municipalities with different revenues. Although receiving pork barrel monies has shown a positive effect on input indicators, when associated with a situation of high fiscal dependence, it can lead to a decrease in spending incentives (or responsible spending), which can also affect process and outcome indicators. Thus, table 9 exhibits the results of the Spatial Durbin Model by interacting with the pork-barrel per capita resource received annually by municipalities with its level of fiscal dependency⁵.

⁵ To allow the interpretation of coefficients, the variable is centralised.

Model seven displays the regression results when the dependent variable is the input indicator of the health policy. The effect of the pork barrel on municipal health expenditure per inhabitant is positive and statistically significant, meaning that with the increase of one unit of pork barrel per capita, there is an average increase of 0.016 in local health spending per inhabitant. Similarly, when increasing one unit of fiscal dependence, local healthcare spending increases by 0.487. But for the purposes of this thesis, these coefficients say little. It is necessary to look at these variables' direct and indirect effects on the input indicator.

The direct effects of pork barreling on local health policy spending are 0.016, meaning that when increasing 100 Brazilian reais to the amount of pork barrel per capita the municipality receives annually, their local expenditure in healthcare increases by 1,60 Brazilian Reais. Similarly, this effect overflows to neighbouring municipalities, where health spending increases by 2.30 reais when the neighbouring municipality receives increases by 100 reais, keeping the local pork barrel value constant. Therefore, in municipalities and their neighbours, there is an increase in per capita spending on health policy. However, given the municipality's level of fiscal dependence, the pork barrel's effect turns negative and significant. This compelling result demonstrates that although pork barrel matters for policy input at the local level when under fiscal dependence, pork barrel policies have their collective effects nullified. Although it is impossible to argue about the mechanism behind this finding, the results corroborate the idea that points to the non-redistributive effects of pork barrel policies (BAIÃO; COUTO; OLIVEIRA, 2020). The empirical unfolding of this result is worrying, especially in countries with a high rate of fiscal dependence among subnational entities, such as Brazil. In short, despite producing collective positive effects, under fiscal dependence, this resource might not affect local political policies (namely, health policy).

Model eight reveals the results when I test the same hypothesis for process indicator – measured by the BCG vaccine coverage in each municipality in a given year. In this model, the results are similar to those shown in table 7. There is a small, positive (0.001) and statistically significant effect of pork barrel grants received by the city on the BCG vaccination coverage rate at the municipal level. To illustrate, if we let an increase of 100 Brazilian reais in the amount of pork barrel policies happen, the average decrease in the BCG coverage would be 0,1. On the other hand, when increasing fiscal dependence, the variation in healthcare policy usage decreases by 0.023 with statistical significance. However, the interaction between the two values yields a very small, positive and insignificant effect. This is true for the target city and its neighbouring areas. Thus, model seven shows that the pork barrel grant does not affect the policy process indicators when taking the spatial interdependence of local units, as its effects remain negligible in contexts of fiscal dependence.

Lastly, the ninth model tests the effects of pork barreling on policy outcomes measured as infant mortality rate when there is a fiscal dependence context. The results again indicate a very small albeit insignificant effect of pork barreling on the infant mortality rate. In turn, fiscal dependence has a weak, positive and small effect on the variation of the outcome indicator of

health policy at the municipal level. However, when budget pork barrel monies land in a fiscally dependent municipality, this effect becomes negative – suggesting a decrease in the infant mortality rate – despite the absence of statistical significance. But despite its small magnitude, the effect still spills over to neighbouring areas, decreasing the average infant mortality rate when their level of pork barrel remains equal – although its effect is very small. This result is particularly exciting due to its practical developments. Although there are positive collective results from the pork barrel on public policy indicators as suggested by a part of the literature (BERTHOLINI; PEREIRA; RENNO, 2018), the body of evidence in this thesis suggests that such an effect happens differently in each location depending on their fiscal reality. In some jurisdictions, pork matters more than in others. In contexts of fiscal dependency, receiving budget amendments can mean a lot to residents compared to municipalities with lower levels of fiscal dependency. In other words, although it is not a redistributive resource *per se*, the pork barrel is a helpful tool in implementing policies in those municipalities where it is difficult to collect. In outline, it is possible to complement the findings of Bertholini, Pereira e Renno (2018) and his co-authors, who claim that the pork barrel produces positive and dissipative effects over time. With the results of this work, it is possible to state that, in addition, the effects spread to the communities close to those that receive the distributed federal resource – at least for input and outcomes indicators. Ultimately, the pork barrel is positive (ROBERSON, 2008; SORRIBAS-NAVARRO, 2011), dissipative (BERTHOLINI; PEREIRA; RENNO, 2018) and spills over to neighbouring areas.

Table 9 – Pork barrel spatial spillover effects under fiscal dependence

	<i>Dependent variable:</i>		
	Spending	BCG Coverage	Infant Mortality
	(7)	(8)	(9)
Pork per capita	0.016*** (0.003)	0.001* (0.001)	0.0001 (0.0001)
Fiscal dependence	0.487*** (0.061)	−0.023** (0.012)	0.002 (0.003)
Pork barrel per capita*Fiscal Dependence	−0.0001*** (0.00003)	0.00000 (0.00001)	−0.00000 (0.00000)
High complexity	29.073*** (6.960)	11.768*** (1.323)	2.435*** (0.299)
Political appointees (share)	353.496*** (33.312)	7.527 (6.327)	3.880*** (1.425)
PBF beneficiaries (rate)	−0.002*** (0.0003)	0.00004 (0.0001)	0.0001*** (0.00001)
National government Coalition	10.751**	1.027	−0.021

	(4.452)	(0.847)	(0.190)
Local government Coalition	−0.688	1.782*	−0.293
	(5.475)	(1.041)	(0.233)
National election	36.537***	2.652***	−0.640***
	(4.657)	(0.886)	(0.199)
Local election	78.466***	−9.975***	−0.686**
	(6.499)	(1.236)	(0.279)
Margin of Victory (Mayor)	0.0003***	−0.00003*	−0.00001
	(0.0001)	(0.00002)	(0.00000)
Seats	3.377***	0.008	−0.043**
	(0.419)	(0.078)	(0.018)
Michel Temer (dummy)	123.495***	−2.053**	−1.013***
	(4.700)	(0.894)	(0.205)
State capital	279.342***	7.540	3.317***
	(25.797)	(4.901)	(1.103)
GDP (log)	−2.801	2.576***	−3.463***
	(2.340)	(0.447)	(0.103)
Spending per capita			0.008***
			(0.0004)
BCG Vaccine coverage			−0.008***
			(0.002)
States (FE)	Yes	Yes	Yes
Constant	10.698	1.941	80.340***
	(54.561)	(10.356)	(2.461)
Observations	11,430	11,430	11,430
Log Likelihood	−78,166.210	−59,055.590	−41,912.700
σ^2	49,348.070	1,784.509	89.506
Akaike Inf. Crit.	156,414.400	118,193.200	83,911.400
Wald Test (df = 1)	1,968.018***	315.132***	61.687***
LR Test (df = 1)	1,609.196***	299.656***	57.873***

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 10 – Impacts of spatial spillover under fiscal dependence

	1			2			3		
	DE	IE	TE	DE	IE	TE	DE	IE	TE
Pork per capita	0.016	0.023	0.039	0.016	0.023	0.039	0.000	0.000	0.000
Fiscal dependence	0.506	0.736	12429	0.506	0.736	12429	0.001	0.000	0.002
Pork per capita*Fiscal dependence	-0.0	-0.00	-0.00	-0.0	-0.00	-0.00	-0.00	-0.00	-0.00
High complexity	30256	43964	74220	30256	43964	74220	24388	0.438	28777
Political appointees	36788	53456	90245	36788	53456	90245	38865	0.699	45860
PBF beneficiaries (rate)	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	0.000	0.000	0.000
National government coalition	11188	16257	27446	11188	16257	27446	-0.02	-0.00	-0.02
Local government coalition	-0.71	-1039	-1755	-0.71	-1039	-1755	-0.29	-0.05	-0.34
National election	38024	55251	93276	38024	55251	93276	-0.64	-0.11	-0.75
Local election	81660	11865	20031	81660	11865	20031	-0.68	-0.12	-0.81
Margin of victory (Mayor)	0.000	0.000	0.000	0.000	0.000	0.000	-0.00	-0.00	-0.00
Seats	35140	51060	86201	35140	51060	86201	-0.04	-0.00	-0.05
Michel Temer (Dummy)	12852	18674	31527	12852	18674	31527	-1014	-0.18	-1197
State capital	29071	42242	71313	29071	42242	71313	33223	0.597	39202
GDP (log)	-2915	-4235	-7151	-2915	-4235	-7151	-3468	-0.62	-4092
Spending per capita							0.008	0.001	0.009
BCG vaccine coverage							-0.00	-0.00	-0.00

Source: The author (2023)

5.3 Not every cloud has a silver lining: spillover effects and policy unevenness

Previous section findings have shown that the pork barrel affects public policies in municipalities that receive pork monies and in their neighbours. Still, such effects are only significantly different from zero when we take into account the input and output stages of policies, with no statistical support for the effect on processor indicators – not even when taking into account the existence of high-complexity medical centres and local fiscal dependence, where pork barrel policies have greater power to influence public policy. Therefore, one of the empirical consequences of this finding is the greater dispersal of the benefits of pork barrel policies, enabling a more meaningful number of citizens to benefit from their collective effects through spatial spillover. Spatial interdependence creates the circumstances to reach a more considerable number of citizens with pork's collective effects, as it promotes the circulation of commuters in neighbouring cities, not only for work and leisure but also to use public services often not offered in their home jurisdiction.

Although the previous findings are insufficient to demonstrate details about such dynamics, they offered evidence about the permeability of geographic barriers and the spillover of the collective effects of pork barrel policies at the local level. In short, the benefits network goes further than only the residents and taxpayers from the target city. However, we know that resources from distributive politics are primarily used for electoral purposes (MAYHEW, 1974), either following the distribution logic of the candidate's electoral geography (AMES, 2003; CARVALHO, 2003; CARVALHO, 2009) or allocating resources to municipalities where political brokers can help turn federal resources into electoral support (BROLLO; NANNICINI, 2012; BUENO, 2018; ZARAZAGA, 2014; ROCHA; GELAPE, 2022). The previous findings

indicate the electoral strategy predominantly used for allocating pork barrel resources but not to identify the mechanism behind it. The spatial analysis that detects the spatial spillover effects can display the spillover effect, which suggests an increase in the number of beneficiaries of the resources sent by the legislator but says nothing about the effects on its electoral basis.

According to the findings of Mesquita et al. (2014, p. 94), legislators direct a bigger share of pork barrel grants to municipalities where they receive electoral support than those where they do not. This is in line with the findings of section 5.2, since it identifies a predominance in the allocation strategy where legislators deliver concentrated resources to some municipalities and disperse a smaller amount to their neighbours. In this case, legislators hope to use budget amendments to increase their electoral base (Silva, 2009). In other words, pork barrel politics are concentrated to disperse electoral support. The graph presents the average proportion of the pork barrel value received by municipalities against the percentage of votes received by the candidate in that municipality, using the amendments destined for municipalities and civil society organizations. In figure 9, it is possible to observe a positive slope in most Brazilian States, meaning that there is a covariation between the proportion of votes that congresspeople obtained and the level of pork barrel delivered. The maps show the dispersion of the votes of the deputies who ran for reelection in 2018, where it is impossible to observe variation in the level of dispersion of their votes.

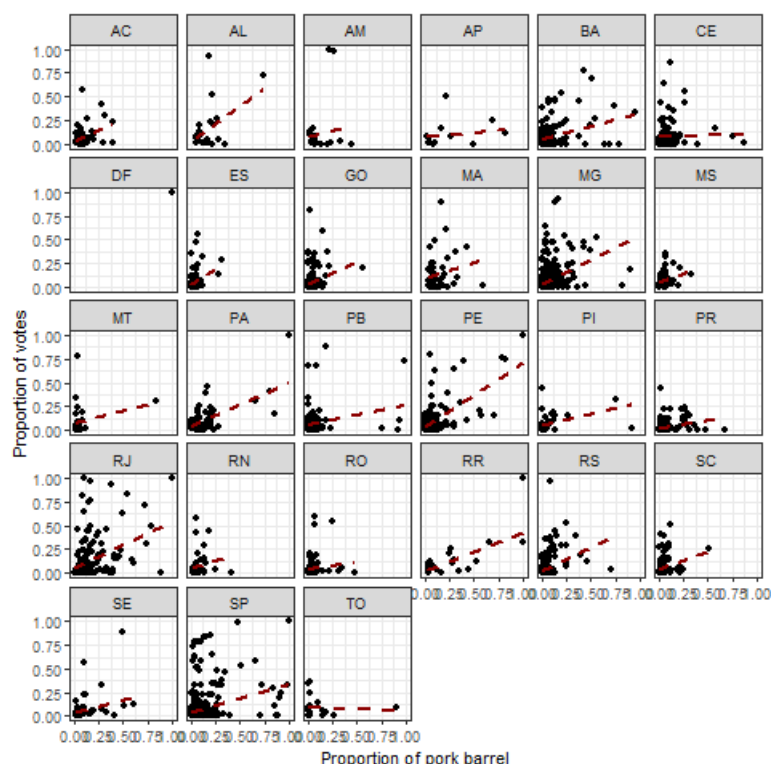


Figure 9 – Proportion of votes and pork-barrel delivered to municipality

Source: The author (2023)

Although they are also not enough to indicate this choice's primacy, such analyses help understand the effects (intentional or unintentional) of the allocation strategy generated by leg-

islators. Despite not having a shred of primary evidence, these results teach us two main things. First, the allocation strategy of pork barrel policies is concentrated in some locations while dispersing little pork monies in surrounding areas, successfully spilling over the collective effects to the units close to the targeted jurisdiction. However, it is not a sufficient mechanism to reduce the disparity between subnational units.

Besides that, although the Brazilian literature argues that legislators have a socially oriented profile when proposing bills (NETO; SANTOS, 2003; LEMOS, 2001), regarding pork barrel monies, they seem to act in a rather particularised manner. In addition to not indicating significant redistributive effects (BAIÃO; COUTO; OLIVEIRA, 2020), its predominant allocating strategy concentrates resources on some units. In contrast, others receive more minor value amendments, which appear only to fulfil the role of disseminating the legislator's benefactors and do not have deep roots in concern with redistribution problems. Thus, although the pork barrel is positive and overflows, it does not help to reduce subnational disparities. In the last instance, every cloud has a silver lining. But, regarding pork barrel policies, this benefit seems to be related to the parliamentary hunger for office and not necessarily with a concern about voters' welfare.

6 Conclusion

In this thesis, I sought to answer the question: to what extent do the effects of pork barrel policies in public policy spill over to neighbouring municipalities? To explore this question, I rationalised the role of space and the dynamics generated from the spatial proximity between local units to understand how this might affect the relationship between pork barrel grants sent by legislators in Congress on public policies implemented by local governments in politically decentralised countries.

Understanding pork barrel policies as one of the main products of the political system (STOKES; DUNNING; NAZARENO, 2014), despite its bad reputation among academics (WEINGAST, 1979; LANCASTER; PATTERSON, 1990; BARON, 1991) and voters (SODRÉ; ALVES, 2010; SPÁČ, 2020), I discussed how this distributive policy (LOWI, 1964; LOWI, 1972) performed as a tool of federal resource decentralization – delivering resources to local unities, even if in an unequal way. In that sense, discussing how resources, especially pork-barrel resources, matter for delivering services and public goods at the subnational level. At this point, while discussing with the scholarship that found positive collective effects of pork-barrel grants on public policy at the local level (BERTHOLINI; PEREIRA; RENNO, 2018; Diaz-Cayeros; ESTÉVEZ; MAGALONI, 2016; TORRES; BASTOS; GAMA, ; ALMEIDA, 2021), I argued that these pieces of evidence might be underestimating pork barrel policies effects even among the most optimistic findings as they ignore spatial dynamics among the relationship (HARBERS; INGRAM, 2017; SALVATORE; RUGGERI, 2021).

In chapter two, I developed my argument that the pork barrel policies' effect is broader when considering spatial dynamics among subnational units. I rationalised that the spatial spillover effects resulting from the spatial interdependence existent among local unities added up to the allocation strategy of distributive politics that legislators use. I qualify how the potential spatial spillover effects can occur, bringing the spatial dynamics of pork-barrel policies to the centre of the stage and discussing the role of spatial interdependence in this matter. More specifically, I argue that due to the scarce amount of money available to benefit the electorate, legislators deliver a higher share of distributive funds for some municipalities in the jurisdiction – usually, the ones that can absorb the demands of the neighbouring areas and better process the benefits. I argue that politicians do not make that by chance but use a power calculus on the electoral and political advantages of these spillover effects. Finally, I discuss the role of brokers in the local electoral connection that enables the allocation and spillover effects to be politically effective. While helps to diminish the inefficiency of the expense since more people have access to the

benefit and allows the representative to negotiate political support on wholesale instead of retail. Consequently, it is politically efficient despite increasing subnational unevenness in policy provision.

These claims could be tested in any country that meets the scope condition of being frameworks with political decentralisation for policy implementation at the local level and fiscal decentralisation. To this end, I have chosen to use the case of Brazil. Not only for having a comparative advantage regarding the knowledge of the case but also for the fact that Brazil has a tripartite federalist arrangement where municipalities are the main actors implementing important policies such as education and public health even though the federation is the entity that keeps most of the collected taxes (ARRETCHE, 2004; ARRETCHE, 2010; ARRETCHE, 2012). In addition, Brazil has the instruments of budget amendments which are the proxy par excellence of pork barrel policies (LIMONGI, 1994).

Chapter 4 presents the data, methods and models used to empirically test this PhD thesis's working hypotheses. I leverage municipal-level information on pork barrel grants and health-care policy indicators. I gathered data on 33,240 impositional budgetary amendments sent from Brazilian Federal Deputies to operationalise the explanatory variable and health indicators for Brazilian municipalities, of 5,214 municipalities as the dependent variable. For health policy indicators at the local level, I follow Januzzi (2001) and break the health indicator into three: input, process and outcome. To measure input, I use local health expenditure; to measure process, I use BCG vaccination coverage among children; finally, the infant mortality rate operationalizes the outcome indicator. The dataset comprehends the five budgetary years (2014-2018). I apply the Spatial Durbin Model that accounts for the interdependence among local units and verifies both the direct and indirect effects in target units and their neighbouring municipalities, respectively. Here, I also explain in detail the specification of the model used to access the spatial effects of pork barrel policies on health indicators in Brazilian municipalities – also in contexts where there are highly complex health centres and depending on the level of fiscal dependence of the locality.

In chapter five, I tested the empirical consequences of the pork barrel's spatial spillover effects theorised in this research. First, I conduct a descriptive analysis of where pork barrel policies are delivered. This analysis contributes to the field of research, as much is already known about the allocation of amendments to specific actors in the political system (FIGUEIREDO; LIMONG, 1999; LIMONGI; FIGUEIREDO, 2005; BROLLO; NANNICINI, 2012; BAIÃO; COUTO, 2017; BUENO, 2018; MIGNOZZETTI; CEPALUNI, 2019; MEIRELES, 2019; BAIÃO; COUTO; OLIVEIRA, 2020). However, we still know little about the level of geographical concentration and the type of municipality that receives the budget amendments sent by federal deputies. In my analysis, I focus on recognising the pattern of locations where the redistributive benefit is assigned and the existence of spatial dependence between these local units. To do so, I employ a global and local descriptive and spatial autocorrelation analysis to understand the existing allocation patterns between the years 2014 to 2018. My results suggest

a rather dispersed allocation pattern with only a few spots with higher shares of pork barrel policies – corroborates a recurrent result in analyses of distributive policy in Brazil – mainly budget amendments – which generally points out to political-electoral aspects that generate incentives for the concentration of budget amendments in one or a few municipalities (AMES, 1995; AMES, 2003; AMES; PEREIRA; RENNO, 2011; CARVALHO, 2003). Furthermore, identify four Local Indicators of Spatial Association (LISA) quadrants, where I find that legislators have at least four main allocation strategies that vary between the amount and the level of spatial concentration of the pork barrel resource. Among them, the primary strategy adopted seems to concentrate a larger share of pork barrel grants in some municipalities while dispersing smaller values among the units around that jurisdiction. This result suggests that regardless of the reason why the legislator decides how to deliver pork barrel policies between the districts of the represented state – she concentrates a larger share in one municipality – which may indicate a focus on the spillover effects.

Next, I implement Spatial Durbin Model analysis to identify the extent to which there are spatial spillover effects of pork barrel policies effects on municipal health policy in neighbouring local units. Here, I contribute to the literature that accesses the positive effects of pork barrel policies on service delivery and policies at the subnational level. By considering space for the analysis, allowing the analysis of spatial spillovers, I seek to contribute to a gap in the discipline that systematically ignores the effects of spatial proximity and subsequent political dynamics (HARBERS; INGRAM, 2017; HARBERS; INGRAM, 2019; SALVATORE; RUGGERI, 2021). My main results suggest a positive (albeit small) effect of pork barrel monies on the indicators of public health policy. This result is especially interesting because it demonstrates to what extent the effect of pork barrel policies was underestimated when not considering spillover effects. Nonetheless, breaking this effect into three public policy indicators seems to lose strength along the chain. The effects of pork barrel policies on public policy input indicators are the strongest – in summary, in addition to affecting health spending in the targeted municipality, the receipt of pork barrel policies also triggers spending in neighbouring municipalities, and this might happen due to a yardstick competition dynamics (BESLEY; CASE, 1992; SHEFTER, 1994; ANSELIN, 1995). However, these results change when we analyse the municipalities according to two facets: the existence of a highly complex hospital and fiscal dependence. In the first case, pork barrel monies do not seem to produce the expected effects on any of the indicators. In any case, the result indicates that the highly complex variable captures some characteristics of the municipality that differ from its neighbours. Meanwhile, despite producing collective positive effects under fiscal dependence, pork barrel monies might not affect local political policies when measuring process and outcomes policy indications but matter in increasing input indicators.

Taken together, these results present evidence that pork barrel policies matter in helping to explain variation in health policies at the local level. More than that, when we consider the spatial dynamics between local units, we can see an overflow of this effect to neighbouring

units. Despite the limitations of this paper, these results corroborate and expand the findings of the literature that accesses the collective positive effects of distributive policies in general and pork barrel policies in specific.

Nevertheless, this work is far from closing the debate on the effects of legislative particularism, mainly because it encountered some fundamental difficulties. With regard to the cases analyzed, there is an important amount of cases that were imputed, which may interfere with the estimates and the prediction capacity of the model. Moreover, the analysis covers only four budget years, which, although an advance in relation to previous research, is still a small number. An analysis of a longer time series may yield more robust results. Moreover, while it dialogues very briefly with the effects of voting and the prospect of re-election, the results could benefit from a more in-depth analysis along these lines.

Finally, the research agenda remains open regarding the possibility of analysing more legislatures and a broader operationalisation of pork barrel politics. Although individual impositional budget amendments emerge as a more direct way of identifying the manifest will of federal deputies to dialogue more directly with the literature, it would be essential to implement different ways of measuring this same variable (with greater or lesser restrictions). In addition, delving deeper into the role of brokers may produce more consistent and valid inferences. Finally, obtaining a qualitative analysis part would be fundamental to confront the quantitative results obtained – and test the robustness of the proposed theory in real life.

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APPENDIX A - Maps: Dependent and independent variables

Figure 10 – Pork barrel per capita distribution per year (2014-2018)

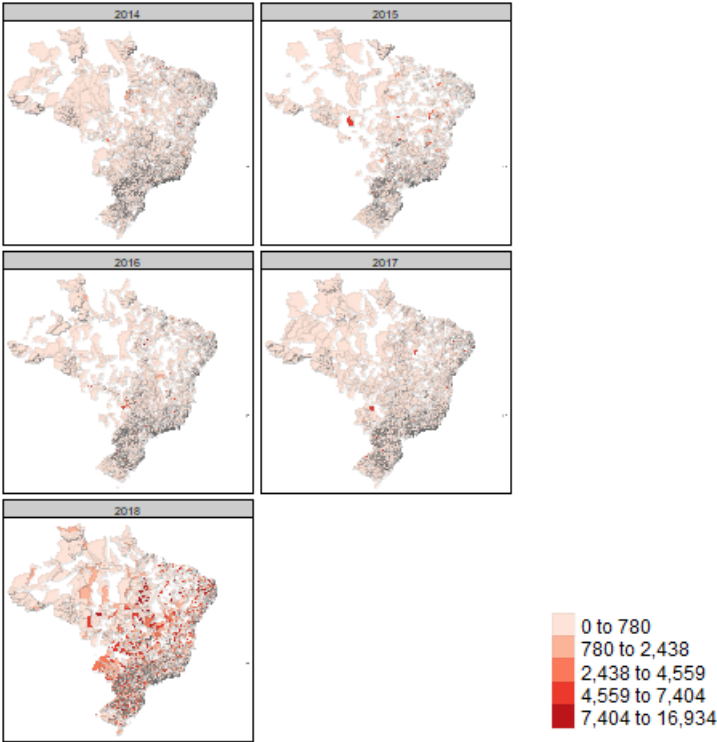


Figure 11 – Spending per capita distribution (2014-2018)

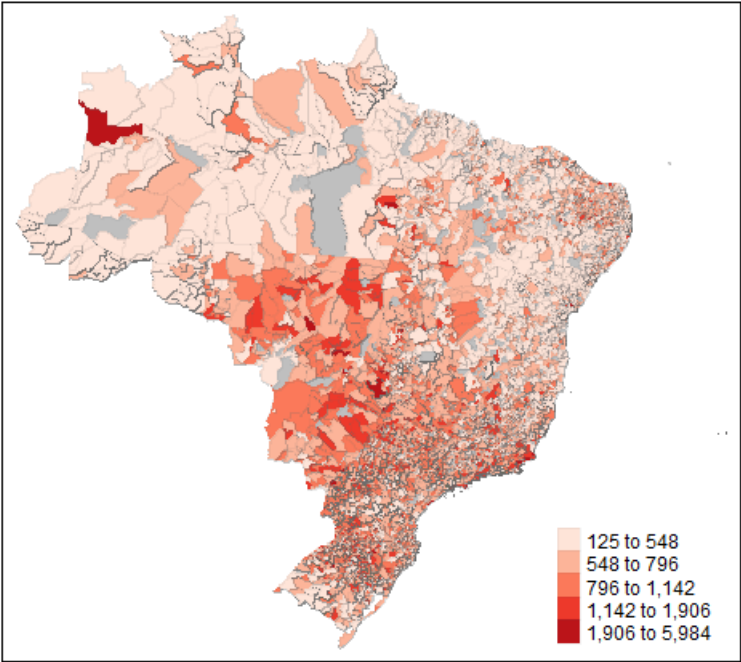


Figure 12 – BCG vaccine coverage distribution (2014-2018)

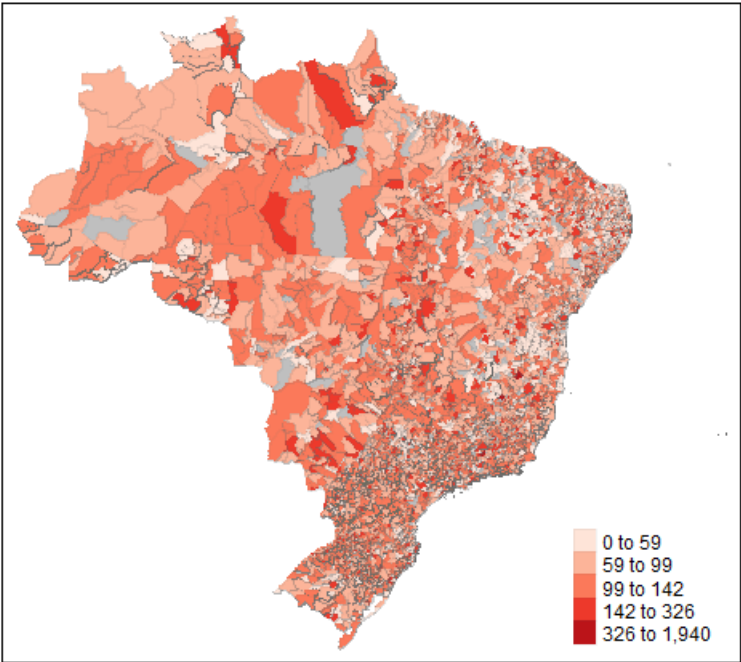


Figure 13 – Infant mortality rate per capita (2014-2018)

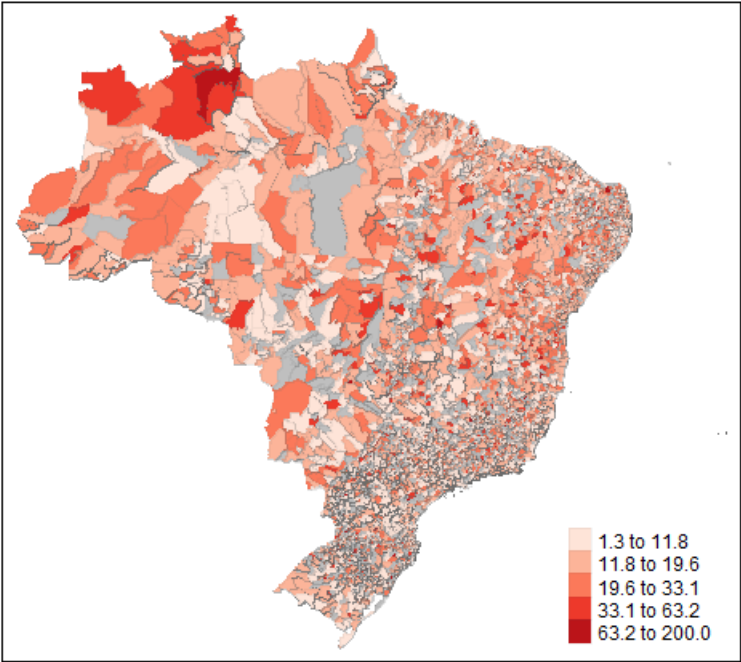


Figure 14 – Spending per capita distribution per year (2014-2018)

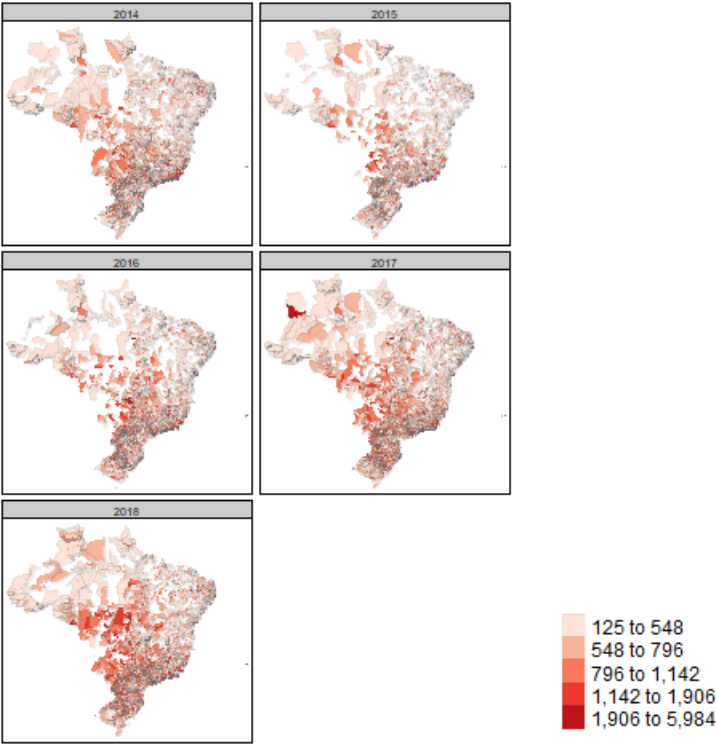


Figure 15 – BCG vaccine coverage distribution per year (2014-2018)

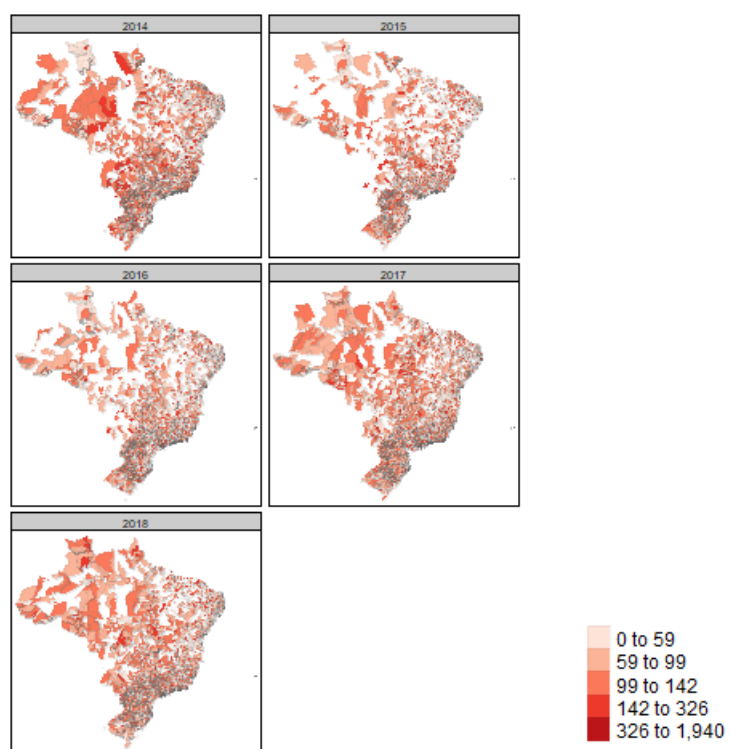
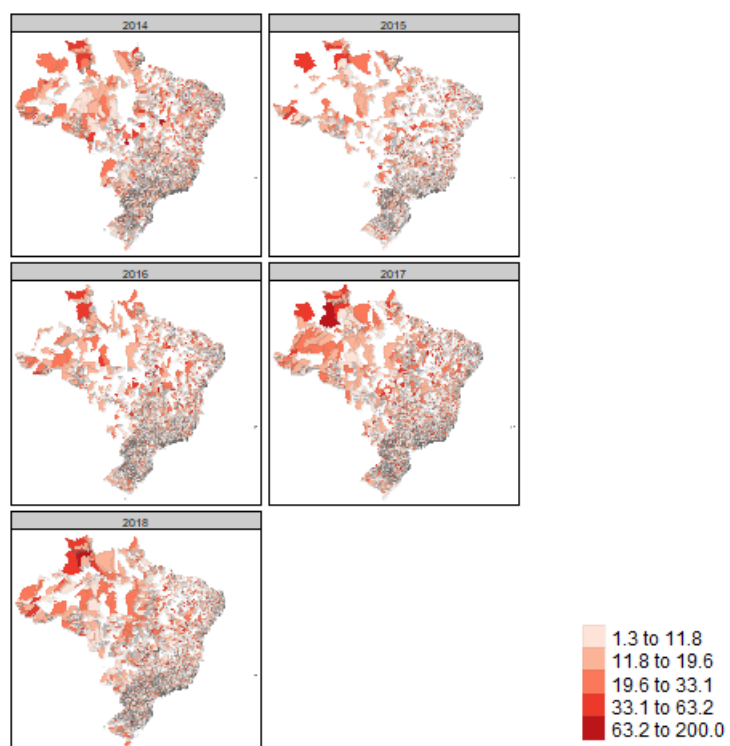


Figure 16 – Infant mortality rate per capita per year (2014-2018)



APPENDIX B - MAPS: GLOBAL MORAN I

Figure 17 – Moran plot of pork barrel per capita (2014-2018)

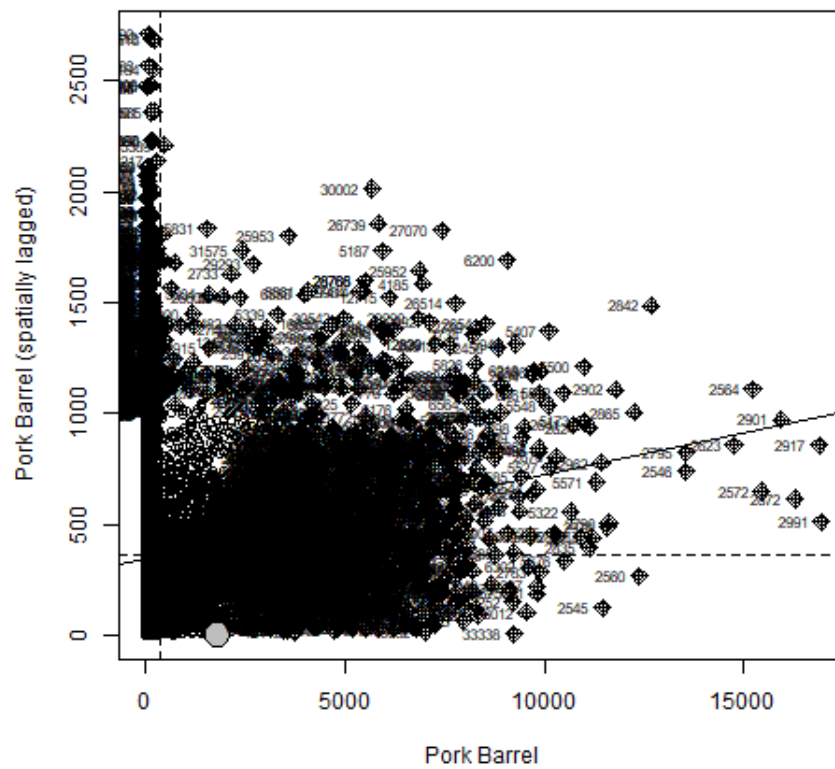


Figure 18 – Weighted neighbour mean pork barrel per capita values (2014-2018)

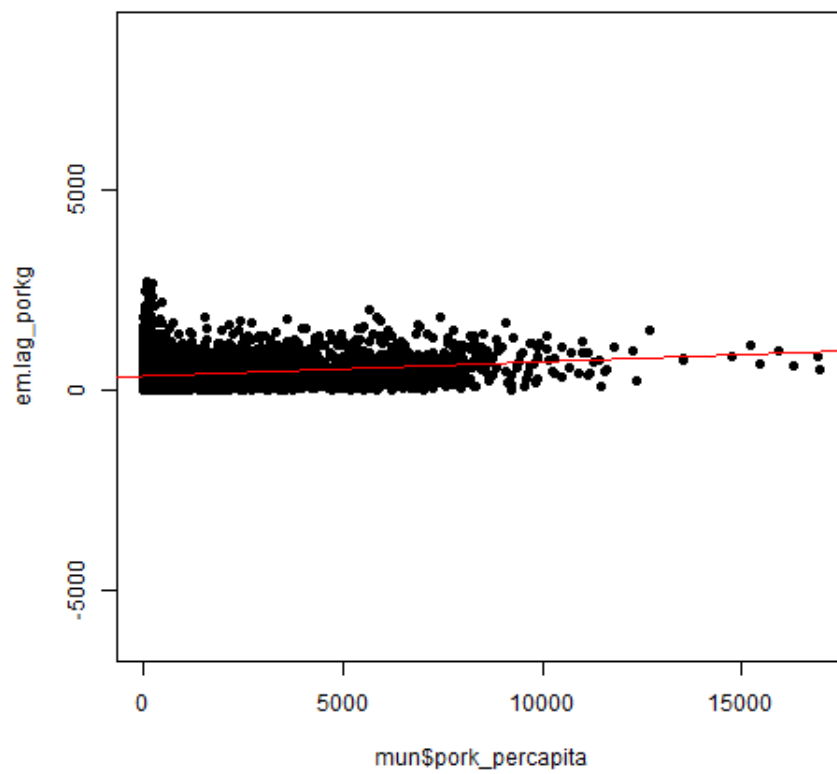
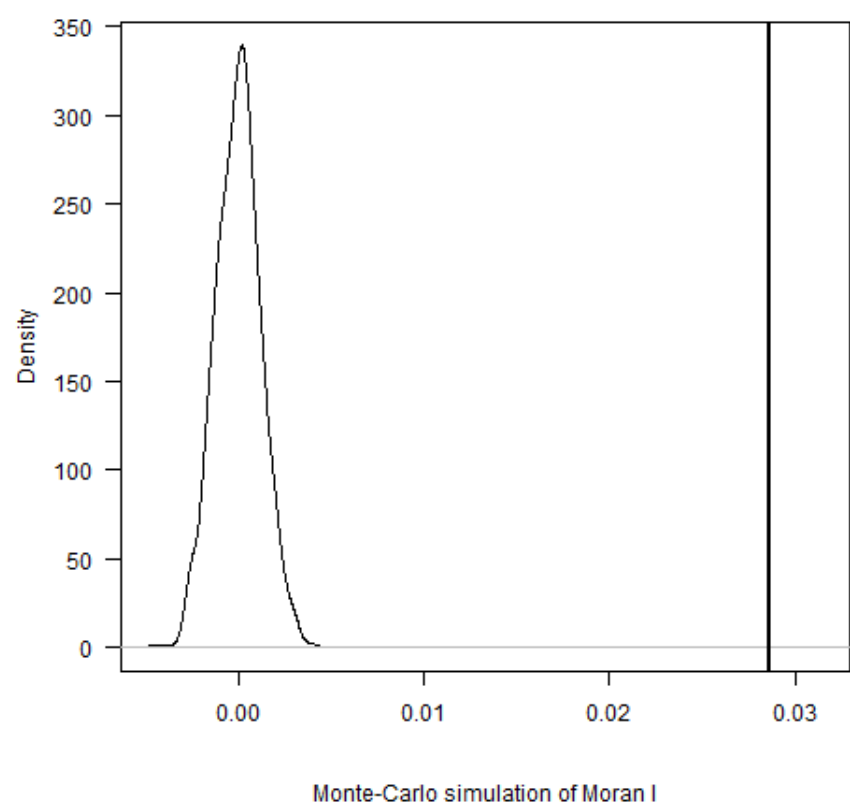


Figure 19 – Density plot of global Moran I from Pork Barrel per capita (2014-2018)



APPENDIX C - QUADRANTS DISTRIBUTION BY CATEGORY

Figure 20 – Quadrants

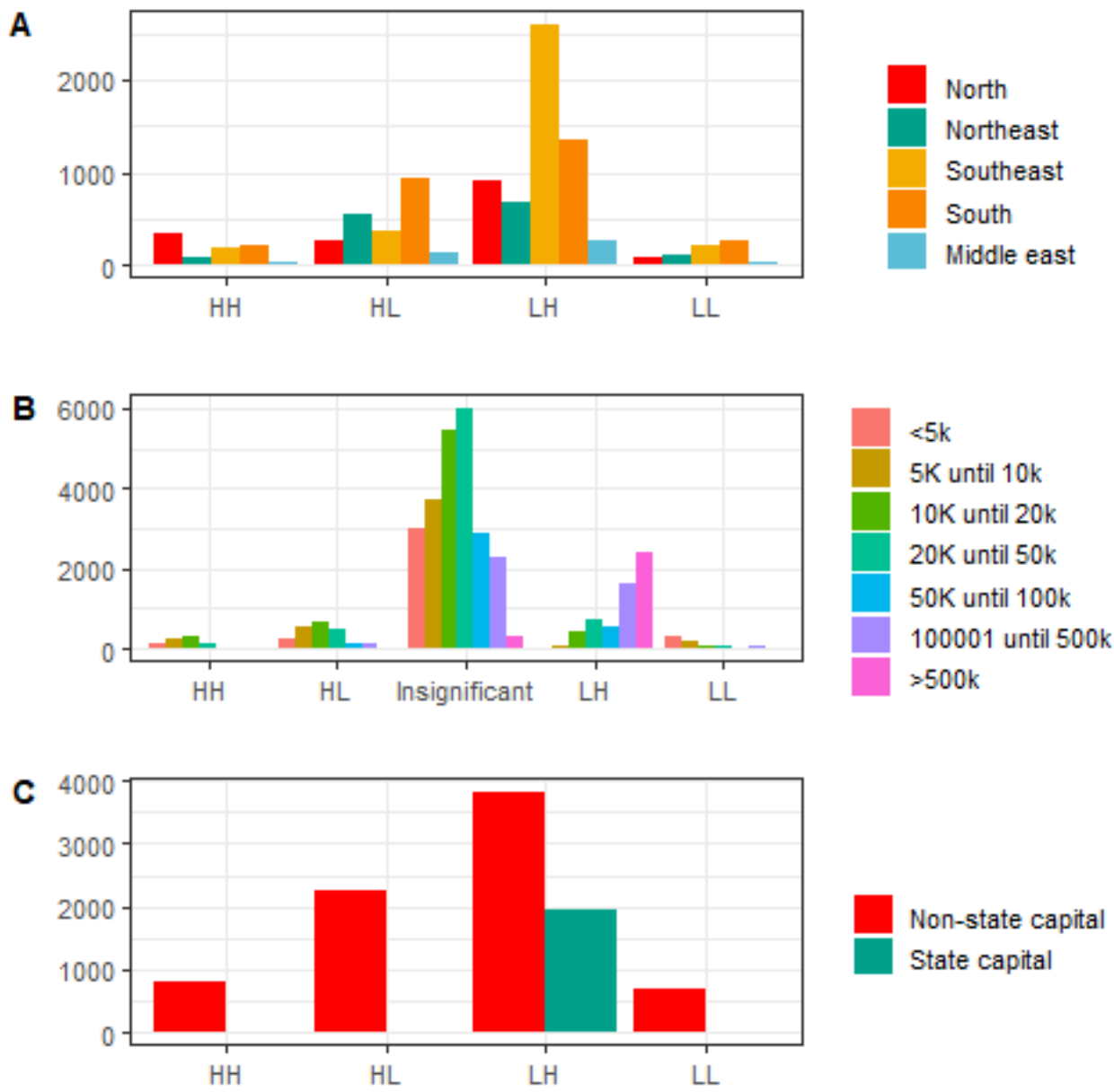


Figure 21 – Quadrants distribution

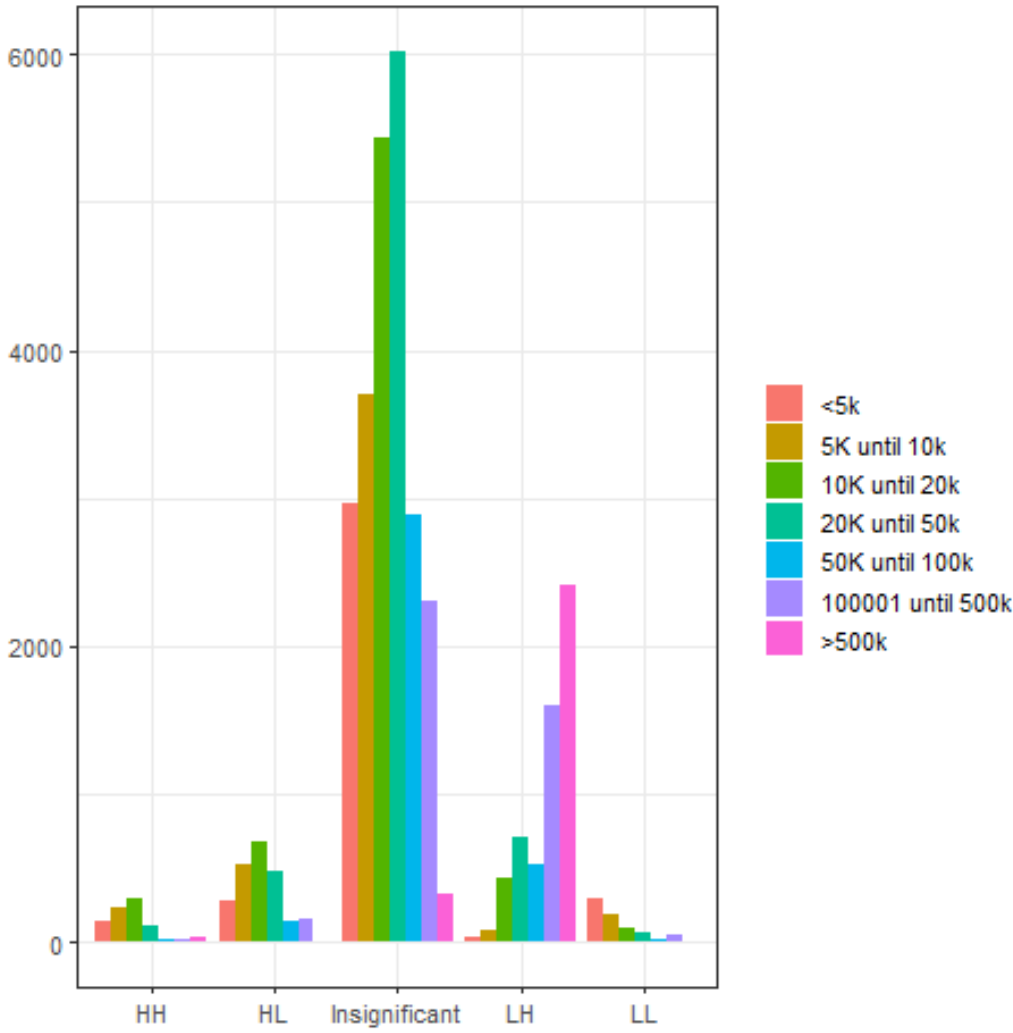


Figure 22 – Quadrants by region

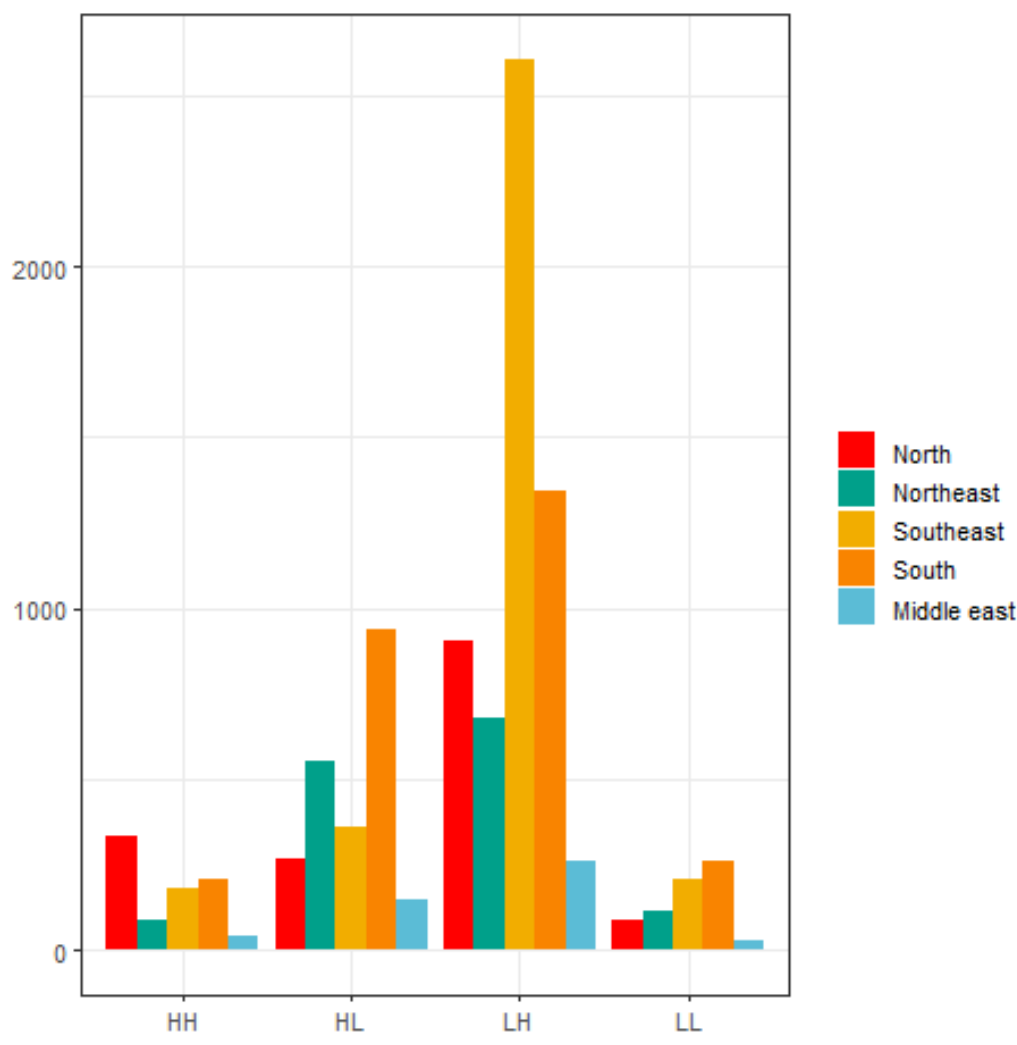


Figure 23 – Quadrants by type of municipality

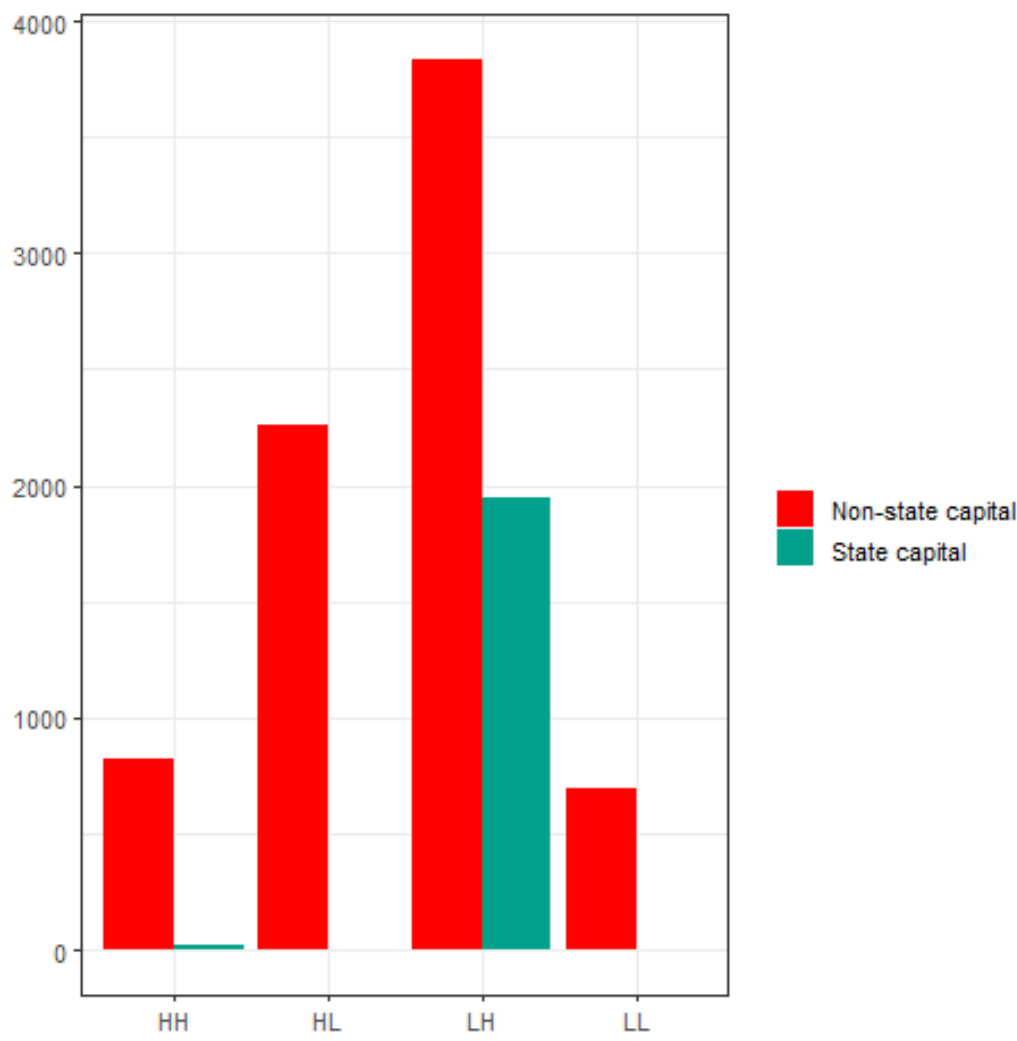
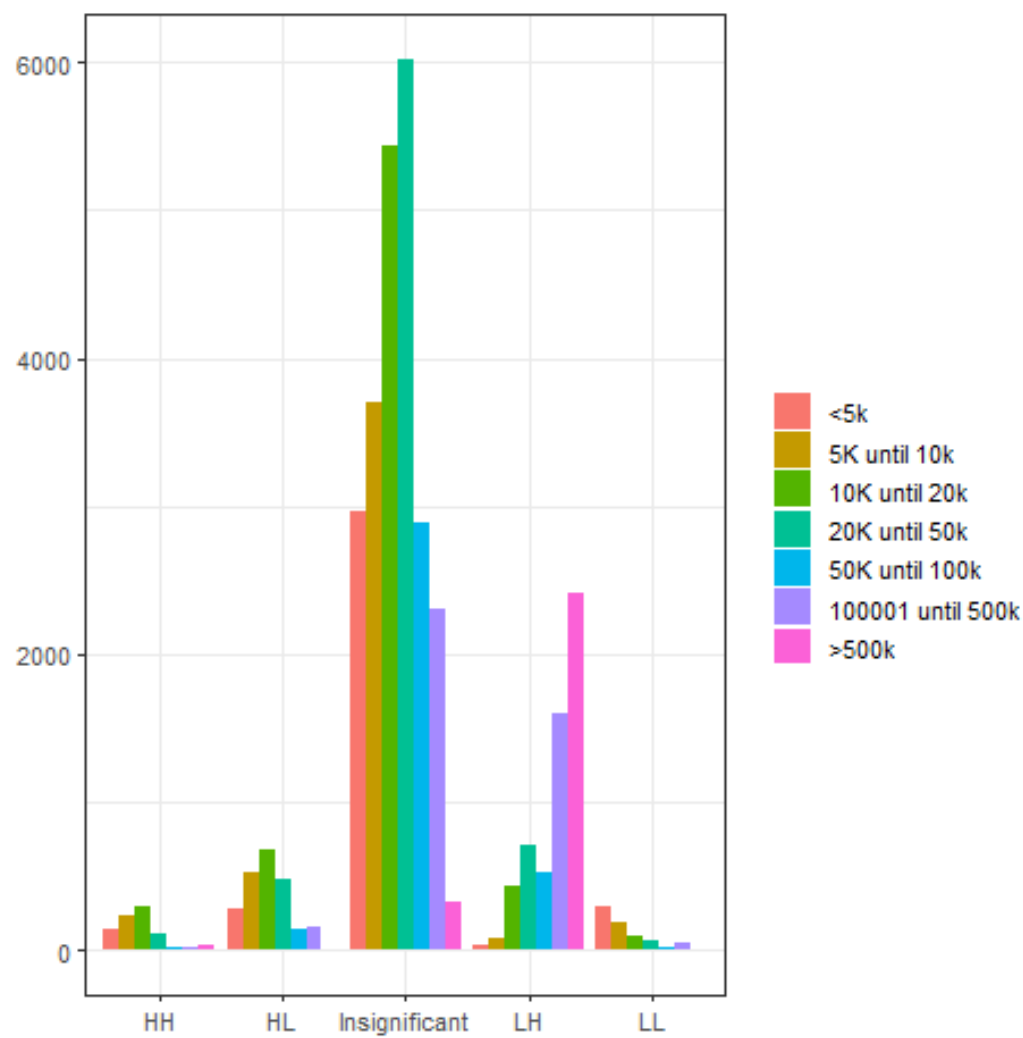


Figure 24 – Quadrants by population range



APPENDIX D - OLS REGRESSION MODELS

Table 11 – Pork barrel effects on health policy indexes (2014-2020): OLS models

	<i>Dependent variable:</i>		
	gasto_hab (1)	cobertura_bcg (2)	tx_mort_inf (3)
pork_percapita	0.005*** (0.001)	0.0002 (0.0001)	0.00000 (0.00003)
dependencia	0.362*** (0.065)	−0.021* (0.012)	0.001 (0.003)
alta_complexidade	30.057*** (7.593)	12.046*** (1.348)	2.577*** (0.299)
gasto_hab			0.008*** (0.0004)
cobertura_bcg			−0.008*** (0.002)
log(pib)	−0.696 (2.527)	2.312*** (0.449)	−3.616*** (0.099)
comissionados_prop	413.851*** (36.295)	8.425 (6.445)	3.535** (1.431)
beneficiarios_pbf	−0.002*** (0.0003)	0.00004 (0.0001)	0.0001*** (0.00001)
dummy_coalizao_prefeito	11.827** (4.861)	1.288 (0.863)	−0.001 (0.191)
COALIZAO_GOV	−3.766 (5.976)	2.206** (1.061)	−0.287 (0.234)
dummy_eleicnacional	27.517*** (5.207)	2.385*** (0.924)	−0.668*** (0.204)
dummy_elecloc	70.699*** (7.132)	−10.061*** (1.266)	−0.677** (0.282)
MOV	0.0004*** (0.0001)	−0.00003* (0.00002)	−0.00001 (0.00000)
QDTE_VAGAS	7.244*** (0.447)	0.076 (0.079)	−0.054*** (0.018)
DUMMY_TEMER	110.665*** (5.276)	−2.431*** (0.937)	−1.017*** (0.211)
CAPITAL	282.357*** (28.140)	7.169 (4.997)	3.208*** (1.108)
UF (FE)	Yes	Yes	Yes
Observations	11,430	11,430	11,430
R ²	0.271	0.089	0.227
Adjusted R ²	0.268	0.086	0.224
Residual Std. Error	242.516 (df = 11392)	43.062 (df = 11392)	9.510 (df = 11390)
F Statistic	114.168*** (df = 37; 11392)	30.050*** (df = 37; 11392)	85.625*** (df = 39; 11390)

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 12 – Pork barrel effects on health policy indexes given the fiscal dependence (2014-2018):
OLS models

	<i>Dependent variable:</i>		
	gasto_hab (1)	cobertura_bcg (2)	tx_mort_inf (3)
gpmc_porkpercapita	0.018*** (0.003)	0.001 (0.001)	0.0001 (0.0001)
dependencia	0.408*** (0.066)	−0.022* (0.012)	0.002 (0.003)
alta_complexidade	30.726*** (7.600)	12.081*** (1.348)	2.580*** (0.299)
gasto_hab			0.008*** (0.0004)
cobertura_bcg			−0.008*** (0.002)
log(pib)	0.606 (2.556)	2.375*** (0.454)	−3.608*** (0.100)
comisionados_prop	413.020*** (36.332)	8.191 (6.446)	3.579** (1.432)
beneficiarios_pbf	−0.002*** (0.0003)	0.00004 (0.0001)	0.0001*** (0.00001)
dummy_coalizao_prefeito	11.935** (4.865)	1.288 (0.863)	−0.001 (0.191)
COALIZAO_GOV	−4.252 (5.981)	2.224** (1.061)	−0.293 (0.234)
dummy_eleicnacional	35.937*** (5.088)	2.617*** (0.903)	−0.654*** (0.200)
dummy_elecloc	75.426*** (7.101)	−9.940*** (1.260)	−0.669** (0.280)
MOV	0.0004*** (0.0001)	−0.00003* (0.00002)	−0.00001 (0.00000)
QDTE_VAGAS	7.162*** (0.447)	0.070 (0.079)	−0.054*** (0.018)
DUMMY_TEMER	119.298*** (5.135)	−2.187** (0.911)	−1.005*** (0.206)
CAPITAL	285.729*** (28.154)	7.224 (4.995)	3.212*** (1.108)
UF (FE)	Yes	Yes	Yes
gpmc_porkpercapita:dependencia	−0.0001*** (0.00004)	0.00000 (0.00001)	−0.00000 (0.00000)
Constant	145.320** (59.336)	33.326*** (10.527)	85.912*** (2.326)
Observations	11,430	11,430	11,430
R ²	0.269	0.089	0.227
Adjusted R ²	0.267	0.086	0.224
Residual Std. Error	242.706 (df = 11391)	43.060 (df = 11391)	9.510 (df = 11389)
F Statistic	110.545*** (df = 38; 11391)	29.316*** (df = 38; 11391)	83.533*** (df = 40; 11389)

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 13 – Pork barrel effects on health policy indexes given the city status (2014-2018): OLS models

	<i>Dependent variable:</i>		
	gasto_hab	cobertura_bcg	tx_mort_inf
	(1)	(2)	(3)
gpmc_porkpercapita	0.013*** (0.002)	0.0005 (0.0004)	0.00003 (0.0001)
alta_complexidade	25.229*** (7.769)	12.981*** (1.377)	2.437*** (0.306)
dependencia	0.363*** (0.065)	−0.021* (0.012)	0.001 (0.003)
gasto_hab			0.008*** (0.0004)
cobertura_bcg			−0.007*** (0.002)
log(pib)	−0.691 (2.547)	2.447*** (0.452)	−3.630*** (0.100)
comissionados_prop	410.064*** (36.332)	8.265 (6.442)	3.540** (1.431)
beneficiarios_pbf	−0.002*** (0.0003)	0.00004 (0.0001)	0.0001*** (0.00001)
dummy_coalizao_prefeito	11.920** (4.865)	1.301 (0.863)	−0.003 (0.191)
COALIZAO_GOV	−3.775 (5.982)	2.196** (1.061)	−0.285 (0.234)
dummy_eleicnacional	32.282*** (5.158)	3.115*** (0.915)	−0.739*** (0.202)
dummy_elecloc	73.451*** (7.122)	−9.636*** (1.263)	−0.717** (0.281)
MOV	0.0004*** (0.0001)	−0.00003* (0.00002)	−0.00001 (0.00000)
QDTE_VAGAS	7.142*** (0.447)	0.070 (0.079)	−0.054*** (0.018)
DUMMY_TEMER	115.827*** (5.213)	−1.676* (0.924)	−1.088*** (0.209)
CAPITAL	282.996*** (28.176)	7.754 (4.996)	3.137*** (1.109)
UF (FE)	Yes	Yes	Yes
gpmc_porkpercapita:alta_complexidade	−0.030*** (0.009)	0.005*** (0.002)	−0.001** (0.0004)
Constant	178.038*** (59.143)	31.267*** (10.486)	86.474*** (2.318)
Observations	11,430	11,430	11,430
R ²	0.269	0.090	0.227
Adjusted R ²	0.267	0.087	0.224
Residual Std. Error	242.752 (df = 11391)	43.041 (df = 11391)	9.508 (df = 11389)
F Statistic	110.389*** (df = 38; 11391)	29.601*** (df = 38; 11391)	83.633*** (df = 40; 11389)

Note:

*p<0.1; **p<0.05; ***p<0.01

APPENDIX E - OLS RESIDUALS FOR SPATIAL CORRELATION

Table 14 – Ordinary least squares residuals for spatial correlation

Model	Observed Moran I	Expectation	Variance	Standard deviation	P-value
1	0.209	-0.002	0.000	62.159	0.000
2	0.084	-0.002	0.000	25.545	0.000
3	0.044	-0.002	0.000	13.834	0.000
4	0.208	-0.002	0.000	61.939	0.000
5	0.084	-0.002	0.000	25.575	0.000
6	0.044	-0.002	0.000	13.791	0.000
7	0.208	-0.002	0.000	61.990	0.000
8	0.084	-0.002	0.000	25.507	0.000
9	0.044	-0.002	0.000	13.972	0.000