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Historical evolution of public expenditure:
theoretical and empirical analysis of the main explanations

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1. INTRODUCTION

The topic of this work is going to make us wander through many lines of research and sometimes we will be forced to trespass in branches that are not often considered similar or attributable to economics; these subjects we are talking about will range from political studies to cognitive science.

That is because multiple and very different answers were given to our research question that is how can be explained differences in public sector sizes in different economies? We will face this topic first from a theoretical point of view through the analysis of publications of several authors, who suggested different solutions to this question, then we will present some data that the other authors used to test those hypotheses and we will discuss the outcome they obtained.

In the fourth chapter our analysis will proceed using econometrics to test some of the hypotheses we found in the second chapter, the reason for running tests on old and already tested hypothesis is the gathering of more recent data respect to the papers we previously analyzed: our sample will be composed of the widest variety of countries that we can control, and the time will range from 1972 to 2018, that is the maximum range that our database allows us to use.

Another thing worth to be pointed out is that this topic sinks his roots way back in history, the founder of the question being Adolph Wagner who lived between the nineteenth and twentieth centuries, since that time many other theories appeared trying to explain the phenomenon. Today, if someone wants to clearly understand the problem, or wants to know the previous literature because he wants to investigate in this field he will soon be blocked by the confusion that all the papers, proposing solutions, also very different one from the other, create in the new researcher; in order to solve this problem for all those interested in having a panoramic view of

the main explanations of the public sector growth second chapter will present some of these papers, the most important ones, but we want to stress that the analysis will aim at presenting them more than discussing them because it is impossible for us to go deep enough in so many field that range from choices theory (Myhrman, 1985) to institutional economy (North, 1991, 2003) passing through fiscal policy (Easterly-Rebelo 1993), economic history (Peacock-Scott 2000) and international trade (Dreher, Sturm, Ursprung, 2008).

This third chapter be divided in two paragraphs: the first will focus as we just said on the test of some possible linkages between public sector size and; while the latter will consist of a descriptive exposure of data with the scope of outlining the actual situation worldwide. The purpose of the test section is to try out some hypotheses with two possible outcomes: strengthen the thesis exposed if our results were in line with expectations or, if our outcomes were coming to be poor, understand to which cause attribute responsibility, having in mind that old models may not be able to keep up with changes in modern economies.

Now for the sake of brevity and schematism we will go through the sections of this thesis: the next chapter will be a satisfactory compendium of all the papers on which this work is based, and we will also analyze them; later we will run some tests according to what we found in order to shed some light on the relation between State and economy; lastly we will expose our conclusions and the bibliography will follow.

2 Literature review

2.1 Overview

Here we will expose and analyze several works coming from different authors each with his own model, assumptions, goal and approach. In order to make the fruition of this work easier we will proceed introducing the main theories of public sector growth like Wagner's Law, Baumol's Law¹ the Ratchet effect and so on; after this first paragraph we will show some data from different papers supporting these theories, but here it is important to stress that even if one scholar focuses his work on one theory instead of another, it doesn't mean that these models are excluding each other, they could be co-explanations of the same problem. In the end we will discuss a couple of papers not strictly related to our research just as an example of how our topic is entwined with other researches.

2.2.1 Wagner's Law

This paper can be considered the milestone of our research because it gives us clarification on what Wagner's Law was when its author created it, and what we intend today, misunderstanding often its original meaning.

Thanks to Peacock and Scott (2000) we discover that the formulation of Wagner's Law dates back to a period between 1883 and 1911 and that what we think as a unique concept was in truth evolved through a series of publications by Wagner. Another unexpected detail is that even the definition of "Law", despite its common use nowadays, caused perplexity in Wagner himself. This specification that could seem superfluous, is important to underline how Wagner was not

¹ Also known as Baumol's price disease

completely sure about his findings, even because his techniques for testing hypothesis were far from our computing power.

Here the thesis of Peacock and Scott come into play claiming that nowadays many authors are making the opposite mistake: they affirm that 80's and 90's are plenty of article willing to test Wagner's Law with the use of latest econometric techniques² but in doing so, most of those who want to make research about Wagner's Law, are not actually testing the proper variables either because they are missing Wanger's thought, either because they are sacrificing the simplicity of Wagner's theory for the sake of econometric effectiveness, making things more complex than what they should be. But let's see more in depth how the authors argue their ideas.

Wagner evolved his thought with time: the first hints of the "Law" can be found in 1883 and it Wagner keeps improving and elaborating until 1911; the following list represents the main elements that Peacock and Scott highlighted from the totality of Wagner's production.

1) According to the Law to an increase in a country's income it corresponds an expansion of the public sector. Growth in government sector should be both relative and absolute, causing a crowd out of private sector. This aspect should affect all the aspects of public expenses, even if the pace at which this growth happens could differ from sector to sector. Wagner also advances a possible explanation of what he observed (without verifying it) that would link the enrichment of countries to a higher need for complexity through regulation and bureaucracy supplied by the government.

2) Wagner specified that in his papers the word "law" was meant as "empirically observed uniformity", which is different from the binding meaning we now attribute to the same

² And we can assure that almost 20 years later things didn't change, being the econometric innovation to test Wagner's Law the focus, for example, of Lamartina and Zaghini's paper (2010)

expression. Moreover he made clear that in his observation he included public finances, central government and public enterprises³.

3) We already said that the instruments owned by Wagner for his analysis were poor and this is reflected by the ambiguity through which he exposes his thoughts. We refer for example to the fact that despite Wagner himself contemplated the possibility that the regularity he observed could be an effect of the specific period used as a sample, we have no definite information about his sample, even though we can be quite sure he refers to the 19th century thanks to the analysis made by Timm (1961) over Wagner's job. And again the same ambiguity is found if we question Wagner about the possibility of an upper limit to the effect he observed: despite he admits the existence of a limit over which government expansion won't be able to go (since it is related to the fiscal pressure on taxpayers⁴), he doesn't claim which this limit could be nor if he believes that there is an optimum level of government that could be different from the maximum.

Actually much more could be said about that, there are so many writings about the limit that public expenditure could and should have that it is a new and different line of research that differs from ours. We will just, as an example, name the paper from Tanzi "The Economic Role of the State in the 21st Century" in which Tanzi shows how, according to him and his interpretation of data, nowadays States can provide all the necessary services without trespassing the threshold of 30% of GDP.

Going more in depth Tanzi sees all the expenditures exceeding that value as unnecessary and caused by a sort of path dependency present in public expenditure, but what we want to

³ Our authors report that Musgrave(1986) underlined how, out of the three elements, the main importance seems to be on the latter, according to Wagner's writing

⁴ The actual level of public expenditure is often thought as the trade off between the government that wants to increase the public spending and the taxpayers that have their income reduced by taxes. Even if this limit can change over time and country, we can always assume there will be a level over which taxpayers won't accept to pay taxes any more in order not to further reduce their income.

extrapolate from is paper is the idea of how the optima level of expenditure depends on the period and there are no rule of thumbs to establish it.

This was the Law as Wagner thought but scholars across time saw in it a variety of possible declination concerning variables that could express better the original findings, sample sizes written in a multitude of compositions each with its hypothesis and its test useful to refute or confirm them.

This is the starting point for Peacock and Scott for their paper: they want to prove that the majority of this spin offs are not actually testing Wagner's Law , despite what they affirm; in order to prove that Peacock and Scott took a sample of fifteen well known papers from various authors and analyzed them.

The first aspect we're going to linger on is the definition of government size: it ranges from government expenditure as a whole to more narrow explanations in which transfers or defence expenditure are subtracted. In the sample of articles analysed by Peacock-Scott they list fourteen different definitions out of fifteen papers. Of course the distance from original formulation of Wagner's Law varies across these articles but there is one element of relevant gravity that we want to point out:

"However, the major misreading of Wagner is reflected in the omission from all the studies of public utilities as part of the public sector" (Peacock, Scott, 2000)

This is important because as Musgrave showed state owned companies are more important than central or local government expenses for the existence of the regularity according to Wagner, so the total exclusion of them from the variables analysed would obviously lead to a very different outcome respect to the observation made by Wagner.

Moving to the independent variables we find the same confusion as before. The idea of Wagner, talking of economic development, can be declined in several ways from total GDP to GDP per capita or GDP in constant prices (despite some difficulties linked to this variable). And once solved the dilemma about the main explanatory variables many other come into play, each with its *raison d'être* but most of them departing from Wagner's origin.

The only other variables that we may find named by Wagner are urbanization and industrialization, but these could make things more complicated: if we move away from the initial and basic idea of Wagner and allow Government spending to be influenced by its composition, then way more hypothesis and lines of research should be taken into account⁵.

Further if we record that Wagner underlined that his observation was true in that period of time he had data about (even if we are not sure about that, studies suppose Wagner analyzed data about the whole 19th century), and he had nothing concrete but sensation that the regularity could hold also in future we could speculate that nowadays, due to a shift in economic composition from heavy industries to services, also the relation between Government spending and level of country development changed.

To test this eventuality many ways can be chosen, but all of them have little in common with what we defined as "Wagner's Law", they are more like these researcher derive from it, yet authors claim they are testing Wagner's idea.

Here we want to move our critiques to Peacock and Scott: even if what they say is correct and they argue well their thoughts we find their point of little interest because all can be resumed to a

⁵ In fact in several analyses that we are going to discuss later the main focus is the composition of government expenses and not its total level. For example in Devarajan (1996) and Dreher, Sturm, Ursprung (2008)

recommendation for new authors to be more specific in their publication that they are not referring to the original definition Wagner's Law and they give to it a broader meaning.

Authors's recommendation becomes even less worthy of attention when themselves make clear that Wagner's law, intended in its original formulation, is nothing but a peculiarity observed that nothing adds to our comprehension of economy if not used as a starting point for many other (and all more complex) lines of research which range from composition of public sector, to fiscal theories or even ending up in other branches like politics and its decision system about the allocation of expenses.

About the sample size, even if Wagner's observations focused on a specific kind of economy, the European industrialized economy of 19th century, it is quite obvious today to look for a regularity in a much broader sense, including as many countries with as many different features as possible; so also by these point of view we don't think modern research should try to resemble more what Wagner did because today we can just improve what he did and the importance of these studies should easily overcome a small nomenclature error.

Being coherent with we just said, and make this work suitable for modern doctrine from now on every time we will talk about Wagner's Law we will mean it as the common sense, unless we explain that we refer to the original Wagner's Law

2.2.2 Ratchet effect

In this paragraph we will suggest another possible explanation for the growth of public sector over time: the ratchet effect.

With this word we intend the sum of three different but linked phases of the process that leads tax level and public spending to constantly increase and one general term to refer to them or to similar phenomena is ratchet effect.

The first authors in which these three phases we are talking about are introduced, are Peacock and Wiseman (1961) with their work "The growth of public expenditure in the United Kingdom" while the first reference to the "Ratchet" effect can be found later with Bird's writings (Bird, 1971, 1972) "Wagner's Law' of expanding state activity" and "The Displacement Effect: a critical note"; while a later and more famous interpretation of the ratchet effect is the one proposed by Buchanan and Wagner (1978) but we won't delve into these different hypothesis since as shown in Dureval and Henrekson (2011) they can be treated as the same thing during hypothesis test; now we will go more in detail and will explain each these phases, beginning with the first and more important one, the Displacement Effect.

The theory of Displacement Effect was born when Peacock and Wiseman noted that growth in public expenditure didn't follow a smooth path but was more like a flat curve with steep jumps upward in conjunction with extraordinary events like wars or epidemics or any other cause that could justify an increase of government size, along with an increase of taxes.

The basic assumption is that the size of the government is the outcome of a trade off between politicians that increase their utility function expanding the public sector and, together with it their influence (Myhrman, 1985), and taxpayers interests, which are negatively correlated with public expenditure when it becomes "too much". So the government would take advantage of these critic situations to bend people's reluctance toward taxes and widen public sector size.

But the Displacement effect on its own cannot explain why, after the anomaly passed, spending doesn't go back to the previous level, so two more effect were introduced.

The second is the Inspection Effect which means that after the crisis economy returns to normality and taxpayer may see that their previous aversion toward higher public expenses was wrong both because now got used to the new taxes and because they don't want to give up the benefits coming from this new level of public expenditure.

The third and final phase that actually happen alongside with the displacement effect it's the Concentration Effect. It means that extraordinary periods, especially wartimes, are favorable periods for the centralization of powers, so local governments see their demanded functions reduced while central government increases its influence.

According to Peacock and Wiseman this happens because in normal times because of statutes or other forms autonomy is protected from centralisation threats, even when this centralisation would bring more productivity or treatment equality; so central government uses any opportunity given to change the composition of expenditure. This aspect is interesting because as we will see in the second part of this chapter many studies look at the central government spending as a proxy for the whole public sector, but according to the Concentration Effect this approximation would be biased.

The reason why these effects, and especially the Displacement Effect are also called Ratchet Effect is because with that word is described the more general situation in which because of a transitory jump upward of a function, it becomes permanent given the inelasticity of the function to go back to the previous level, as it happens for public expenditure according to this explanation.

2.2.3 Baumol's Law

The Baumol's Law, also known as Baumol's cost disease is another theory that tries to explain the growth of government size in the economy. Baumol's work began studying a particular sector, the

art sector when he noticed that despite the productivity of musicians didn't change over centuries (the example he uses is that the same quartet is needed to perform the same Beethoven's sonata, and in the same time, with the same quality and so on) the wage of musicians rose.

The explanation of this phenomenon is that even if some jobs don't increase their productivity or they don't increase as much as manufacturer workers, in order to keep the equilibrium on the labor market all the wages have to rise more or less together.

From this starting point Baumol added the assumption that the public sector is the one that gains more from the disease because is the more labour intense and with the lowest substitution rate between labor and capital because education and health that are the more important public aspects are labor intense sectors.

Summing up Baumal's Law claims that private wages rise thanks to technological development in the private sector, this increase involves also public sector wages in order not to disrupt the labor market equilibrium but since the public output is constant the outcome is just a nominal increase in public expenditure despite any increase in productivity because the public sector is labor intense and cannot substitute capital with labor.

Having explained what the Baumal's Law is, we want now also stress some common critiques to it; these critics are not coming from us, but are so commonly recognised that can be found in "Intermediate Public Economics" by Hindriks and Myles (2006) a textbook for intermediate students.

"There are a number of problems with this theory. It is entirely technology driven and does not consider aspects of supply and demand or political processes. There are also reasons for believing that substitution can take place in the public sector. For example, additional equipment can

replace nurses and less-qualified staff can take on more mundane tasks. Major productivity improvements have also been witnessed in universities and hospitals”(Hindriks, Myles, 2006).

2.2.4. Myhrman analysis

There are also several explanation that relate the growth of public sector with politics or, more precisely, with politicians' behaviour. Differently from what we saw with Wagner's Law the public spending doesn't increase because, getting more developed and more complex, people need a stronger intervention from the State; it's the government itself that, for reasons that will see more in detail later, chooses to supply more goods and services, to increase its relevance in the economy.

The paper that we chose for representing all the explanation that set public growth explanation in government agents choice theory is “Reflections on the growth of government” by Myhrman (1985).

Myhrman's paper has a clear and rigorous structure: he begins explaining how to introduce institutions into a neoclassical view of the economy, then he evolves this idea until he expose the problems that this view has; then he moves to his theory that overcomes the previous problems putting at the centre the government as an active agent.

Now let's go in depth in Myhrman's paper and let's analyze his work.

The starting point is, as we said, the standard neoclassical model and its assumptions: perfect competition, perfect and symmetrical information, absence of frictions and so on. If these

assumptions hold we already know that is possible to achieve the maximum level of efficiency only thanks to the market, so there would be no need for any institution or government.

Anyway reality doesn't work like a neoclassical model and that and market doesn't work at its maximum level; In neoclassical theory these periods are believed to exist only in the short run because on the long run the market is able to self adjust and find the equilibrium again; so according to neoclassical scholars the scope of institutions is only to intervene during these failures and try to counter the negative effect or accelerate the return to the equilibrium when problems arise.

Therefore governments are passive agents that only react when market needs and their actions are only driven to restore the previous situation; in order to be able to do that neoclassic authors assumed that even if markets weren't characterized by perfect information, at least governments had perfect information, otherwise it would be impossible for them to know exactly what to do and in which measure to restore the market. We want to linger on this step to underline, as also Myhrman does, the paradox we came to: if government had perfect information as neoclassical theory assumed to guarantee its efficacy then socialist economies, in which government substitutes itself to the market, should be exactly as efficient as free market economies: instead of being generated by demand and supply levels, prices would be set by the omniscient government that, thanks to its knowledge of the economy, would guarantee always the maximum efficiency.

The idea of State Myhrman has been portraying until now is the Minimal State, composed only by defence police and a legal system which are the only functions needed to guarantee and enforce private property rights; but reality is far from this situation, what we usually observe is the National State. The switch from the first stage to the latter can happen only if coercive tax power

is given to the government, and this eventuality could happen after mankind developed two tools that upset the political environment:

- Techniques to assess and collect taxes based on income tax instead of trade. Income taxes began to spread around the 20th century
- Voting systems with broader franchises. This allowed scholars to elaborate the median voter theories that we often use nowadays to explain some voting trends.

So it is now possible to build a model that keeps neoclassical assumptions like perfect information and links government size to demand for public goods and redistribution depending on the median voter tastes⁶.

Yet when this model is tested against data we find that it is poorly supported in fact it doesn't manage to explain why government size should keep growing even after having built all the institution that characterized the passage from the Minimal State to the National one; what Myhrman assumes is that most services benefit of economies of scale and once the framework of institutions is built, he expects expenses to grow less than proportionally respect to income (which is the opposite of Wagner's Law) if there aren't further explanation. Another question that this model fails to answer is why private sector should be crowded out: even if we assume that the demand for some services like education or social security keeps growing, why should be public sector to rise and to provide it?

Myhrman concludes, and we agree with his statement, that neoclassical models are unable to explain government size, then the author moves on to the next approach which consist of an

⁶ Since we are still in a neoclassical framework we now the median voter will use his vote to maximize his utility, increasing or decreasing taxes according to his income respect to the average one

enrichment of the previous model through the inclusion of transaction costs, which means we have to drop the frictionless hypothesis that characterizes neoclassical tradition.

About that, Myhrman quotes North⁷ who points at transactions and information costs as fundamental elements, or even as the main reason of governments to exist, so a model like the previously analyzed one couldn't be satisfying since it neglected those two aspects.

North's explanation focuses on the technological progress of 19th and 20th century which led to a change in relative prices that stimulated the creation of a more specialized economy and stronger division of labour, stimulating demand for government since higher levels of complexity in economy and society require regulations and institutions provided by the State.

According to Myhrman, North's hypothesis falls when we compare income and public expenditure of developing against developed countries: differences within each group, like those between Sweden and Japan, are bigger than those between groups. Myhrman considers this observation enough to reject the idea that public spending is driven by income; despite we could argue that it still could be a co-factor, and that so many supporting studies have been published in favour of this hypothesis that it would deserve a more complex reasoning to be rejected, we want now move to Myhrman's idea. He suggests to reverse the effect-cause relation between income and government growth.

From now on we will take into account that government isn't a passive player, politicians are also trying to maximize their utility functions; which means we are removing the last neoclassical assumption, and government is now an actor. The politician depicted in this model has his own utility curve that is maximized gaining as much power as he can, but is constrained by the goal of winning the following elections.

⁷ Whose paper will be analyzed in this thesis later

In order to do that he could create or just use the asymmetry of information between himself and his electors: he could overemphasize benefits of his policies and hide part of the costs. Doing that he would increase government expenditures. So information costs are the turning point of the situation: both politicians and voters sustain these costs, the former in order to learn the tastes of the voters, so to be sure of re-election doing exactly what his voters want, and the latter to control the work of politicians and not be fooled by information asymmetry.

This is the first supply side explanation that we propose: the level of public spending could depend on how a political system manages to reduce information costs between voters and politicians.

This model would be able to explain why government size would rise that much also in those sectors where the market could be as much, or even more efficient than public sector: it is the maximizing tendency of politician to make them will to spread their influence as much as they can, providing goods and services not strictly needed. A similar reasoning can be done to complete theories expressed by Becker and Lindbeck over subsidies. While they explore the functioning of group of pressure that ask for subsidies, they cannot explain those aids allocated to non organized groups; Myhrman explains that politician would attempt to increase their influence and obtain votes distributing these subsidies.

Myhrman ends his work pointing at what is, according to him, the way to follow to find the truth on government size. He says that he believes the principal agent problem is the more interesting path and he suggests researchers should focus on searching the behaviours of special interests groups and of politicians, and how different political system influence information costs which is the framework in which all Myhrman hypothesis are set.

About that we want to point out that this paper is from 1985 and that there is a huge difference between those days and today: internet. Web changed completely the world of information, it is

much easier for voters to do some research about the costs of policies, their effects and at the same time it reduced costs for politicians to learn voters' preferences; if as Myhrman suggests information costs are the turning point, we should see in data a radical change in the last ten years and especially in some countries.

2.2.5. North analysis and the importance of institutions

The next author is Douglass North who, starting to work in the economic history field, is now considered the one who created "the new institutional economics" thanks to his works in 70's and especially with the paper "The Rise of the Western World: A New Economic History". Later on, he developed his studies on institutions economics, and its relation with growth, and achieved the Nobel Prize in 1993. So despite the huge bibliography that North produced we chose two of his works; the first is a paper from 1991 published on the "Journal of Economic Perspective", while the second is quite brief because is a speech that North made in 2003 for the United Nation Economic Commission For Europe. The topic of both the publications, are the institutions, their history, their objectives and so on; we reputed this aspect important for our analysis because what we call shortly government expenditures there is a whole world that shapes indirectly also the size of public sector and now we will show how.

Institutions were created with the purpose of increase order and reduce uncertainty, which can be translated in economic language in reducing information asymmetries and frictions.

Institutions evolve incrementally, so North claims that the history of economic performances can only be understood through a comprehension of institution's evolution.

The first stage is the village, characterised by a closed economy that we could call autarky. Here players know each other because they interact repeatedly with the same people, so informal

norms institutions like reputation or promises are sufficient and there is no need for more complex structure.

After this level we see trade becoming more important and more complex and this will make transactions costs rise: firstly because there are physical and cultural barriers to overcome since players don't belong anymore to the same community, and secondly because increasing gains from defection require norm enforcement. Anyway people found some solutions to reduce agency and diversity problems; for the former we see a development of family business because blood ties were able to reduce defection probability and increased the trust merchants could put in far agents; the latter problem was harder solved through a standardization of measures and cooperation between merchants that even established their own rules⁸. All this process was made possible by, and at the same time caused a, reduction of information costs.

Afterwards the industrial revolution came and social changes like urbanization and factory working with it. This situation required formal institutions and a higher coercive power. In this society is still true that blood ties assure more trust, but economy grew that much that gains from defection are too big to be stemmed without new tools like contracts. Another prerequisite for the generation of capital markets is the respect of property rights: the author explains that as long as rulers could arbitrary subtract or change the value of assets was impossible the growth of such market, so only modern States guarantees the respect of laws that make possible the development of this age.

The last step of this history is the present time and the world we live in. Our world is so entwined and markets worldwide connected that institutions grew again adapting themselves to this environment.

⁸ Merchant law courts or any organization able to enforce coercive power

Summing up as economy and society get more complex this complexity brings higher frictions and transactions cost, so institutions change in order to reduce these costs and make the development we mentioned above sustainable.

In order to link North's paper to the main topic of this work we want to briefly go back to the moment in which governments bounded their history to institutions.

As we said there was a moment in which rulers gave up their power to undermine private property rights, North points at the Glorious Revolution as the very first event; as a consequence capital market arose and with it institutions had to be implemented.

These new institutions were for the first time under the control and responsibility of the government and weighted on its budget, generating new fiscal pressures, also because it was the first time in history that public debt, given the commitment of rulers to refuse arbitrariness, had to be financed through regular source of taxation.

In the second work North (2003) talks of a slightly different topic: why some institutions work better than others, or at least which are more favourable for economic growth, and how can we improve the actual situation. The starting point will be once more a neoclassical model and then it we will tackle two problems that we find in it: absence of friction and absence of time evolution.

About the first problem we already mentioned in Myhrman analysis (1985) that in a frictionless economy institutions are useless, in fact they are not considered in neoclassical models, yet reality is full of frictions and institutions have a very sensitive role in it.

North says many interesting things about norms, institutions and inherited beliefs, but what really interests us is his explanation of personal vs. impersonal exchange and the role of institutions in this transition.

Personal exchange, from game theory point of view, pays fair play, living up to standards and cooperation; on the other hand impersonal exchange pays defection and "take the money and run" practices. In this context move from one situation to the other requires to reshape institutions and strengthen the enforcement part: the first step, says North, could be a reputation system that pays honest players and punishes others, but as the market gets bigger and there are many markets available the cheating player could move to another part of the market and keep cheating. It would be impossible to track him without enormous information costs (again because of the number of players and sizes and number of markets) so a third part is needed to take care of the enforcement of contracts and punishments to defectors; this third part is usually the State

"You have to create a political system that will put in place rules and laws and enforce them at low cost, that make it possible to have successful impersonal exchange on a worldwide basis" (North, 2003)

But until what North is saying is quite close to the ideas we already saw in his previous work, despite the fact that here the explanation is clearer and more structured. On the contrary what comes now is a new idea that is useful for us to explain the increase of government's expenditure over time.

Rich countries have a more specialized market and they need a way to put together all human capital with low friction costs. Again this job is done by institutions.

Until now we saw institutions as what made possible long distance trade but to a deeper look they are what make possible the whole society to exist: just to use the same example as North, the classical theory of demand and offer would suggest that a highly specialised worker like a chemist in a third world country should be a valuable resource because can provide something that almost none else can; yet reality is that knowledge is useless because the costs to integrate it in the

economy and society of that country would be enormous, while in a developed country, which already sustained costs for building institutions, the human capital of a chemist is immediately and perfectly integrated.

The last part of the paper is about how can we improve institutions so that they can stimulate growth, especially where there is lack of them, but unfortunately what North notices is that there is little we can do about that for three reasons.

The first one is that how he explained in the beginning, institutions are made of three components the formal rules, informal norms and the enforcement characteristics; what we observe from data costs and outcomes are the results from the interaction of these three factors, yet the only one on which mankind has direct control is the first one, the formal norms. At this point North explains through an example that choosing a formal framework that works in another country and to apply it in a different environment doesn't work, but it is such an obvious outcome that we prefer to move directly to the second point.

The problem is that even if we could find the perfect solution to these problems, it is not economists' choice whether to apply it or not. Large parts of the economy and for sure that regarding institutions are subject to politics and we can't be sure that political system or its delegates will be efficient. There are studies trying to improve politics structure so that personal interests are crowded out and their behaviours are driven by a sort of competition in which their interest is only related to country's one but until these studies won't come to an end, this problem will stay still.

The third problem and its solution suggested by North is also the conclusion of North's speech; the point is that the economy is a non-ergodic world which means there are no bases, no fundamental structure that we can grab to and starting from it try to explain all the rest. In economy all is a

product of human mind, so all we know is just the degree of understanding we built until a certain point; nothing is certain. What is good is that despite the impossibility of full comprehension we can appreciate the outcomes, productivity and technological progress are good examples for economy's side, and these measures are constantly improving. At this point North says that scientific knowledge must face two aspects of human experience: demography and institutions; about the second he cites his theory of adaptive efficiency as the path to follow in the future, adaptive efficiency means having flexible institutions able to adapt at the best of their possibilities to new problems humanity is going to face.

Is no doubt that such a solution would imply loss of economies of scale in institutions and would need high resources to be that flexible. Anyway that is only a theory and only if it is going to be adapted we'll have data to measure its costs and its results.

2.2.6 Alesina-Wacziarg and Rodrik: The openness and country size theories

We choose to end this section analyzing these two papers together in order to highlight the similarities they have. Not only they were written almost in the same period but actually each is an Rodrik (1998) we find an explicit answer to Alesina and Wacziarg, proving the interaction between these scholars, but more than these anecdotes what links these papers is their subject.

Both link government spending to openness to trade, but, as we are going to show, explanations will be different.

We will proceed with Rodrick's paper for chronological order; actually Rodrick published this work in 1996 but, after the work of Alesina and Wacziarg that heavily cited it Rodrik chose to review it, and to include an answer to for the other two scholars. This version reviewed (Rodrik, 1998) is the one we will refer to.

The subject of the paper is the correlation between trade and government dimension and the explanation that Rodrik gives; it is based on the idea that government spending is used by countries to increase safety against shock coming from outside.

Now we'll delve in his paper to see what's more in his work.

Rodrik identifies Cameron(1978) as a forerunner of his job since he identified openness as the best predictor of government's tax revenue: during 60s trade became more free as a consequence countries got industrialized and this made union trade stronger and this drove labor union to ask and to obtain more welfare and transfers provided by the government; so this long succession of events was believed the explanation of the relation between openness and public expenditure.

Rodrik started from these bases but diverged from them: Cameron's work used only 18 OECD countries but its explanation is unlikely to meaningful for more than 100 countries all over the world. Further the relation doesn't hold only for transfers, but also for government consumption, and it holds also for developing countries in which trade unions don't exist or are not strong enough to obtain anything. So even if the intuition of Cameron is precious, another explanation seems to be needed; and here begins Rodrik's work.

The regression used by Rodrick contains several variables that we already met in our travel:

- Per capita GDP: is what we started from and is the variable that is supposed to catch the effects of Wagner's law
- Dependency ratio: people inside the labor force on people outside the labor force, also this is quite common and relevant in almost any study
- Urbanization rate: also this was present in Wagner's original work
- Dummy for socialist countries

- Dummy for OECD countries
- Dummies for regional areas
- OPENNESS: it is the main variable we want to explore; it is calculated as the average of the prior decade of the sum between imports and exports over GDP

The dependent variable used is only the average of real government consumption as a percentage of GDP from 3 to five year. Rodrik here operated a risky decision because we know in how many ways several of these variables can be declined, anyway the results are roughly satisfying: Wagner's law has the unexpected sign but it's not statistically relevant, socialist and OECD dummies follow the same path, dependency is positive and significant as it had already proved to be and also all the regional dummies, while urbanization is negative and only partially significant. But as foretold the more interesting variable is openness and it is also the more evident: it is grossly significant and enters with a positive sign (coefficient 2%).

This is a good starting point but here the main focus was to find an explanation of this phenomenon commonly observed, so the author chooses to run further tests; some of these tests are interesting and deserve particular attention. The first consist of splitting the sample in two according to per capita GDP while the other introduces two new regressors, both representing a way to calculate country size: land area and population.

Dividing the sample in low and high income countries assure us that the relation between openness and government holds for both situations and is not affected by the level of development of the country; the second test actually confirms Alesina-Wacziarg (1997) idea that we will face soon but also doesn't reject Rodrik's idea, so seems like these two hypothesis have to coexist.

The final step of the paper is a verification of Rodrik's explanation through different measures of openness or external risk are; data seem to confirm Rodrik's idea with government size that increases with external risk both in panel and cross sectional samples. Interesting also is that these variables crowd out the effect of openness: openness is relevant to government size only as long as can be used as a proxy for measuring external risk, while once external risk is included in the regression we can appreciate that any increase in openness can have no effect on government size.

Assumed that the previous finding is correct we could expect even a stronger correlation between exposure to risk and social security then public consumption, but this answer holds only in most developed countries. Rodrik's explanation to this dilemma is that countries without a strong social security system are unable to use it to reduce risks and prefer to use consumption to reach the same objective, while countries that have already developed institutions to that scope, show the increase in the social security component.

So this is Rodrik's explanation of the relation between openness and government size and we just quoted Alesina and Wacziarg work, now we will talk about it and show why it is so entwined with Rodrik's one.

Alesina and Wacziarg open their paper stating that their work's purpose is to supply evidence in favour of two hypotheses; the first states that, during the formation of national countries, there are two forces: one pushing toward bigger countries so to divide public expenditure over a higher amount of people and, thanks to economies of scale, reduce per capita costs; the opponent force pushes for fractionalization due to the fact that ethnic heterogeneity implies increasing social costs.

The second hypothesis claims that openness is negatively related with market size; this because on one side big countries with huge internal market need less trade⁹, and on the other hand as trade gets more free, countries can split without suffering economic backlash as long as commerce keeps flourishing between states.

The two facts taken together would confirm the observation done by Rodrik that open countries have bigger governments expenditures than closed economies.

Rodrik's explanation, as we just saw, was that bigger governments needed to resist more and more frequent external shocks due to openness. The new explanation of this paper says that this phenomenon is mediated by the size of the country, without rejecting Rodrik's explanation.

So what Alesina and Wacziarg sustain is that open countries are small and being small can't exploit economies of scale showing relatively bigger public sectors respect to big and populous countries that have both economies of scale taking public sector expenditures down and internal markets big enough to be less dependent on trade openness.

The first hypothesis is tested through an analysis of secession and mergers starting from the end of the Second World War: it is out of doubt that the period between 1946 and 1995 was characterized by an increase in free trade, well the authors make us notice that the same period shows a proliferation of States (from 74 to 192) mainly small new countries.

The model realized by Alesina-Wacziarg tells us that an increase of population can be either positive, null or negative on the government expenditure; this is because any additional unit of population makes public goods less expensive for each taxpayer increasing the total desirable level and, at the same time, allows individuals to spend more of their income on private consumption.

⁹ At least this was the commonly accepted theory during 90s, the recent development of China proves that it is not always true

Which of these effects prevails depends on the degree of substitutability of the two goods, also known as elasticity.

Since the explanation of Alesina and Wacziarg focuses especially on increasing returns they chose to measure government spending through its consumption over GDP excluding interest payments, transfers and public investments because these other variables should not be affected by economies of scale. In addition to that a series of other variables are added in order to find out in which sector these returns are more relevant.

On the other hand, openness is mainly calculated as Rodrik did, so they only took into account imports and exports over GDP, and put beside it a list of other variables capturing the other determinants of public expenditure; in this list we can find some already discussed variables like the dependency ratio, the level of per capita income, and so on but also new variables like the population density or a dummy accounting for the presence of war in the period.

The result of the regression tells us that if population increases actually each share of government consumption on GDP goes down thanks to economies of scale; the scope of this effect is that doubling population reduces consumption of 0.77% of GDP.

Once stated that overall consumption is negatively proportional to population we could look at its composition to underline which goods (mainly non rival goods) drive this relation and which ones instead are positively related.

Transfers and interest payments costs, as thought since the start, are not related to population size; the same is found about education but this finding is particularly relevant because education is usually considered a rival good and, for this reason, it was expected to be unrelated to country

size, just like defence; instead data show that large countries spend less on education respect to small countries.

The last step to conclude their paper requires Alesina and Wacziarg to research a link between trade and country size. The relation is strongly evidenced by data, despite all controlling variables introduced.

So Alesina and Wacziarg demonstrated that bigger countries are less open and have smaller governments, and that the opposite happens for small countries; yet nothing this far supports their hypothesis more than Rodrik's one, so they chose to conclude their paper with one last regression that introduces external shocks, the explanation proposed by Rodrik for these size differences. Actually this last test doesn't solve the matter but show how results can appear in favour of one or another solution just slightly changing regressors, sample or control variable; from this ambiguity Alesina and Wacziarg derive, also because of the high collinearity between size and openness, that both the effects are present and that a unique explanation is not possible.

3. Supporting data

Until now we have been showing the most important and more commonly accepted theories, but economics, like any other modern science, requires a solid data background for a theory to be considered valid; sometimes the hierarchy of several hypothesis is directly related to the number and the importance of the empirical verification that it generated: more appreciated hypothesis and more solid ones will draw a higher number of studies until someone won't be able to overcome the old idea with a better one.

This of course is a rough way to establish the validity of a theory yet it gives us some hints; for example is out of doubt that Wagner's law is the backbone of public spending explanations not only because it was published before other explanations but also for the huge amount of literature that it produced, while the Baumol's law tests are scarce and hard to find in the literature.

Having this in mind now we will outline some of these papers and which effects their conclusions have on the theories we talked about earlier.

As always our starting point will be the Wagner's law and about that we will present two papers, as an example, being the scholars that worked on Wagner's law a lot. The papers chosen are "Wagner's law in OECD countries" by Lamartina and Zaghini (2010) and "The futile quest for a grand explanation of long run government expenditure" by Durevall and Henrekson (2011) which is an especially useful document to us because it at the same time presents an interesting test of Wagner's law and of the ratchet effect at the same time.

3.1 Wagner's Law test by Lamartina and Zaghini

This is the perfect archetypal of studies on Wagner's Law: Lamarta and Zaghini chose the most reliable data using as a sample all the OECD countries and as time span years between 1970 and

2006, and claim to be confident in obtaining better results than their predecessors thanks to a new econometric technique that should improve the effectiveness of their test, despite the small size of the sample.

In this case the focal point of the paper is that thanks to pooled mean group (from now on PMG) the authors will be able to exploit at the maximum level the cross sectional side of their sample, overcoming in this way the scarcity of data that affected all the studies that were carried that far, without renouncing to the info deriving from the time series of the sample

This is possible because PMG allows coefficients and errors to be determined cross section specific while imposing equality of the long term coefficients between groups. This would allow all the specific features of each country to affect short term aspect but would leave Wagner’s Law as the only driving force in the long run to explain levels of government expenditure.

The authors state that they wouldn’t be satisfied to detect a general co-movement of income and public spending¹⁰, but they want to go in depth and verify if it is true that public expenses show an elasticity higher than one respect to income, which is what they call Wagner’s Law in a Strict way.

Pooled estimates of baseline model

	PMG	MG	FE
long-run coefficient	1.0281	1.1273	1.1416
(std error)	(0.0093)	(0.0446)	(0.0051)
adjustment coefficient	-0.2152	-0.3206	-
(std error)	(0.0330)	(0.0414)	

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¹⁰ What they call Wagner’s Law in a loose sense

¹¹ Tab. 3.1 Elasticity of per capita GDP respect to public expenditure, base line model, Lamartina - Zaghini 2010

PMG estimates of alternative models

MODEL	<i>elasticity</i>	<i>ECT coeff.</i>	MODEL	<i>elasticity</i>	<i>ECT coeff.</i>
No outliers	1.0278 (0.0093)	-0.2187 (0.0362)	Levels	1.0165 (0.0055)	-0.1697 (0.0317)
Free lags	1.0188 (0.0053)	-0.2669 (0.0608)	Real variables	1.0911 (0.0455)	-0.1605 (0.0262)
Demeaned	1.1474 (0.0194)	-0.2248 (0.0304)	EU-14	1.0574 (0.0221)	-0.2720 (0.0377)

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The previous tables include the final aim of the paper, in fact the result shows an elasticity above 1 which means that when the per capita GDP (whatever measured, alternative measures are in the second table) increases of one percentage point, the resulting government expenditure increases and the increase is relatively bigger than the one relatively to the GDP.

If we want to express the summary of the paper through the words of the authors:

“The paper has provided some new empirical evidence supporting the existence of a long-run positive correlation between public spending and GDP growth. Relying on recent contributions on the econometric technique dealing with panel data, we were able to exploit both the time-series and the cross-section dimension of a panel of 23 OECD advanced economies” (Lamartina, Zaghini, 2010)

¹² Tab. 3.2 Elasticity of GDP respect to public expenditure, alternative models, Lamartina - Zaghini 2010

3.2 Double test over Wagner's law and ratchet effect: Durevall-Henrekson analysis

The next paper we want to talk about is the Durevall-Henrekson one (2011). In this paper the authors want to test two possible explanations to the increase of public expenditure, the first is the Wagner's Law while the second is the ratchet effect.

What makes this work unique, as the authors claim in the introduction to the paper, is the huge time span chose to analyze the two competing hypotheses: the data sample is composed by two time series, one referring to the United Kingdom and one to Sweden, showing data from the 19th century on.

The authors chose these two countries as representative of two extremes of the same cluster; both are wealthy western countries with similar incomes, yet they show very different levels of public spending. Sweden symbolizes welfare states with high government spending while UK stays for liberal countries that give priority to market mechanisms.

Because of this particular sample most of the common variables used in cross sectional analysis of Wagner's Law have to be dropped since it is quite obvious to expect some autocorrelation in data like population, ethnic fragmentation, size of the country; this is because even if we consider changes over two centuries, these couldn't explain the huge range of values that public expenditure assumed.

Given this framework the authors proceeded with tests to find out which and how many of the hypotheses could be confirmed; in fact ratchet effect could be present even in case Wagner's Law was confirmed. Several tests were carried on for example Dickey-Fuller unit root tests, and we discover that series can be considered as integrated of order one, then Engle-Granger test is done looking for cointegration while Gregory-Hansen test is needed to allow for breaks, which is a core

assumption for the ratchet effect hypothesis.¹³ The last procedure to clean data is represented by the elimination of possible outliers through dummy saturation technique and we find that data during WWII, especially for England are to be dropped, and we find no surprise in this outcome, being war periods special situations in which conventional standards hardly are kept still.

Unfortunately the results from Durevall-Henrekson paper shed little light on our core question: either Wagner's Law or ratchet effect aren't fully confirmed or rejected. Wagner's Law seem not to hold in the early stages of industrialization, approximately until 1860 but then data support it for one century except that in the period between the two World Wars. In truth we can't consider this as a complete failure of Wagner's Law, it is actually a good result because it fails only where data are less trustworthy either because very back in time, either because of the warfare.

What is more concerning for those who believed in Wagner's law validity are the data from 1975 until 2006. These data are almost surely correct but don't support Wagner's Law nor ratchet effect, which found some support only in the interwar period: it definitely can't be considered as an alternative explanation to Wagner's Law, it can be detected sometimes but only as an additional effect, not the main explanation of public spending's growth.

But Durevall and Henrekson didn't stop finding poor results in the first two explanations, they chose to test also the dependency ratio over time and the result is that public expenses are found to depend mainly on the dependency ratio, which is the sum of people outside the working force divided by the working force itself. The idea is that people older than 65 and those younger than 19¹⁴ employ most of the public spending so that the main explanatory variable is not real income

¹³ Engle-Granger and Gregory-Hansen tests share the same null hypothesis (no cointegration) but the latter has as alternative cointegration with or without structural break so that, according to the combination of the outcomes we can understand both if there is cointegration and if there are breaks

¹⁴ The test was calibrated to face social evolution so that in 50's the benchmark was set at 14 years old

anymore but the number of people in these two bands, which is represented by the dependency ratio.

This idea which is not a broad new intuition by Dureval and Henrekson since we find similar results in Shelton(2007); anyway if we test again Wagner's Law using dependency ratio as a control variable, we find that data support it for the whole period 1920-2006.

In this way the two authors arrived to a conclusion similar to what Peacock and Scott: Wagner's Law is something more complex of the early observation made by Wagner himself, so if we want nowadays use it to study the evolution of public spending we will always have to add other explanatory variables, in this case dependency ratio, because the level of income per se is not able to explain the whole phenomenon.

3.3 Effects of openness and globalization over public sector: the development of the research

A huge amount of literature has been produced over the nexus between globalization and public expenditures, both from the theoretical point of view and from the empirical one.

For the first aspect two main theories are those that gained more attention and deserve to be taken into account; on one side some scholars like Wallace Oates (1972) believed that, trying to attract or at least not removing capital inflows, governments as their economies got more open had to decrease taxes and, as a consequence, reduce welfare; on the other hand economists like Rodrik (1998), as we saw, though that risks bound to globalization would be reduced by governments expanding the public sector.

These contrasting theories are commonly called the competition (or efficiency) effect and the compensation effect. Anyway empirical tests couldn't tell us which of the two forces is the prevailing one and their results are conflicting or poor.

One example that we chose to show here is the paper from Garrett and Mitchell (1998) because it capitalises the previous studies and inserts new procedures and special care in some steps improving the final outcome.

Their paper, "Globalization, government spending and taxation in the OECD", analyses data about OECD countries during the period 1961-1994, and uses several measures both for globalization and welfare: globalization or international integration can be split in multiple phenomena, increase of international trade can be a proxy for sure, but also FDI flows, import from low wage countries, covered interest rates differences or certain indexes can be valid proxies as well; and is this division that allows us to see the uncertainty deriving from the two effects: tests on all these variables suggest different relationships between globalization and welfare, depending on the variable itself.

An analogous effect is found depending on what is considered for welfare: public sector as a whole can be divided in: expenditure, consumption, social security services, or tax rates composition (one hypothesis of the efficiency effect is that tax burdens are moved from capital to labor and consumption because the last two are harder to move from one country to the others).

This table efficiently summarizes the findings of Garrett and Mitchell.

Facets of globalization	Economic policy				
	Total government spending	Government consumption	Social security transfers	Capital tax rate	Capital/(labor + consumption) tax ratio
Total trade	– Efficiency	– Efficiency	– Efficiency	(–) (Efficiency?)	+ Compensation
Low wage imports	(+) (Compensation?)	NS	(+) (Compensation?)	(–) Efficiency?	(–) (Efficiency?)
Foreign direct investment	NS	(–) (Efficiency?)	NS	+ Compensation	(+) (Compensation?)
International financial openness	– Efficiency	NS	NS	NS	NS
Covered interest rate differentials	NS	*	*	NS	NS

The + and – signs denote the direction of statistically significant (at the 0.1 level) relationships. Signs in parentheses denote relationships where the ratio of the coefficient to the standard error was greater than 1, but not significant at the 0.1 level. Efficiency = less welfare state effort; compensation = more welfare state effort. NS denotes that the parameter estimate where the ratio of the coefficient to the standard error was less than 1. *Results not reported.

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The table shows that results are complex, depending on the couple of variables there are coefficient positive or negative, small or big, significant or not significant, in favour of this or that hypothesis, to sum up is impossible to draw a clear dependence between globalization and welfare.

Years passed without the ambiguity on this relationship being deleted, yet scholars didn't stop researching this field, in fact they evolved the search, as we can see with Dreher Sturm and Ursprung who in 2008 wrote a paper called "The impact of globalization on the composition of government expenditures: Evidence from panel data", whose core is not the investigation of a raw link between international integration and welfare, but how governments reallocate resources and adapt their welfare programs. We already know that there won't be strong increases or decreases in public sectors, but their components could change a lot as it changes the level of openness.

Going more in depth the paper is organised as a double test using two different datasets, one bigger composed of 60 countries and covering a time span between 1971 and 2001; and a second

¹⁵ Tab. 3.3 Compensation, efficiency and the globalization-welfare state nexus, Garrett-Mitchell, 1998

one only for OECD countries starting in 1990; globalisation is analysed through four measures the first two of which are very common in literature and need no further explanation since they respectively are the sum of imports and exports over GDP and the sum of inflows and outflows of FDI as a share of GDP. The third measure of globalization is an index build on the restrictions to capital transactions; it is actually composed of four indexes that contribute to the final value each one capturing some aspects of international capital trade¹⁶.

The fourth and last way to measure globalization or trade openness is the KOF Index, which was conceived by one of the authors of the paper, Axel Dreher. It is particularly interesting because it doesn't just takes into account economic integration but also social and political dimensions allowing a wider look on this complex phenomenon and recording data that others measure don't catch. (Dreher, 2006).

On the other side we have dependent variables that in one dataset are capital expenditure, consumption, interest payments and transfers, while in the second dataset, available only for OECD countries public sector follows a division called COFOC that stays for Classification Of the Functions Of the Government. The functions used in this dataset are: public services, defence, public order, economic affairs, environment, housing, health, recreation, education and social.

Before discussing the results of this work one last step is missing; the authors creating their equations assumed that country expenditure shares could be affected by choices in other countries. We are quite skeptical about this assumption and also the implementation of the idea arises some doubts: the weights of the equation are built according to the distances between

¹⁶ Restrictions used for creating the index are the following: restrictions on payments for capital account transactions, separate exchange rate(s) for some or all capital transactions and/or some or all invisibles, surrender requirements for proceeds from exports and/or invisible transactions, and restrictions for payments on current transactions.

capital cities reflecting the higher importance given to neighbours respect to distant countries, yet this approach doesn't look efficient to us if applied to a small sample like OECD countries¹⁷.

Furthermore the authors added other control variable, much of them are commonly related to public expenditure in literature like age dependency or total level of expenditure; others will be dropped because found to be irrelevant.

Here we present only those selected by the authors proved to be relevant at 1% level, table 3.4 refers to result of the world sample, while table 3.5 is about the results of the OECD sample.

	World - Trade		World - FDI		World - Cap. Rst.		World - KOF	
	<i>F</i> -test	<i>p</i> -value	<i>F</i> -test	<i>p</i> -value	<i>F</i> -test	<i>p</i> -value	<i>F</i> -test	<i>p</i> -value
Exp. share (-1)	2,614.56	0.00	2,604.80	0.00**	2,592.38	0.00**	2,591.02	0.00**
Age dependency	9.48	0.00**	9.15	0.00**	8.78	0.00**	6.96	0.01**
Central gov. exp.	41.22	0.00**	38.87	0.00**	40.82	0.00**	40.76	0.00**
Inflation	41.48	0.00**	38.55	0.00**	32.47	0.00**	39.84	0.00**
Trade	1.03	0.31						
FDI			0.84	0.36				
Cap. Acc. Restr.					0.46	0.50		
KOF Glob. index							0.02	0.87

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	OECD - Trade		OECD - FDI		OECD - Cap. Rst.		OECD - KOF	
	<i>F</i> -test	<i>p</i> -value	<i>F</i> -test	<i>p</i> -value	<i>F</i> -test	<i>p</i> -value	<i>F</i> -test	<i>p</i> -value
Exp. share (-1)	1,219.94	0.00**	1,225.72	0.00**	1,219.27	0.00**	1,190.74	0.00**
Central gov. exp.	20.01	0.00**	17.78	0.00**	19.95	0.00**	18.80	0.00**
Inflation	66.56	0.00**	62.44	0.00**	43.30	0.00**	57.77	0.00**
Central gov. debt	5.69	0.02*	9.18	0.00**	8.60	0.00**	9.92	0.00**
Trade	0.58	0.45						
FDI			0.66	0.42				
Cap. Acc. Restr.					0.58	0.45		
KOF globalization							0.47	0.49

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¹⁷ As an example, Berlin is extremely close to Bratislava, but we don't think German politics give it more relevance in building fiscal policies than Paris, Rome or even Washington.

¹⁸ Tab. 3.4 World sample results – Relevant Variables (Dreher, Sturm, Ursprung, 2008)

The results are surprising because in none of the regressions globalization variables seem to be relevant, while others control variables are much more important; we won't report here all the results because they can be found in the original paper but we want to discuss a little these findings.

The analysis was focused on the relation between globalization and public expenditure composition but is still relevant to underline that give us no information about its total level; yet also focusing on the composition features we have poor results, so at any level of consideration, globalization is never a key determinant of public spending, neither for its composition nor for its overall level.

3.4 A precursor of our paper: Shelton analysis

The scope of Shelton (2007) in his paper similar to what we are going to do in the 4th chapter: he gathers and then tests all the main hypotheses with updated data²⁰ to see which ideas are supported by his data and which are not.

While doing so Shelton claims he found a new explanation to Wagner's Law, and we'll judge the validity of this new finding in addition of previous ones.

The distinctive traits of this paper, according to its author, are that he will take into account the bulk of possible explanations considered valid by the scientific community instead of focusing on only one hypothesis, so that it is going to be impossible to repute his work partial or missing some relevant variables; the second characteristic that makes this paper worthier than others to be analysed is that it includes spending not only at central level but also at local government level, which is uncommon to find in most of the studies because different countries may differ a lot in

¹⁹ Tab. 3.5 OECD sample results – Relevant Variables (Dreher, Sturm, Ursprung, 2008)

²⁰ Respect to the papers in which these idea where originally exposed

lower administration composition making comparisons hard to do and, further, data are less abundant, so that samples get shrank.

Moreover Shelton is not only going to consider level of spending but also its composition, and he is going to do it both for central government and for local administrations, so that his analysis will also be able to spot if there is any relation between the destinations where resources are allocated and the explanatory variables.

But moving to our analysis of Shelton's work we find particularly interesting the division he makes about explanatory variables: Shelton says that there are two categories of explanations for the level of public expenditure: supply side or demand side explanation. The demand side consider the allocation of resources as driven by the desires of the population, so many explanatory variables are linked to demographic characteristics or features specific of the Country²¹; on the other hand supply side explanations try to build models in which is the political structure of the country to shape budgets, so their explanatory variables are often closer to political sciences than economy. Often there is a strong correlation between supply and demand variables, so excluding one or the other, many studies are biased because they miss part of the explanation

At this point Shelton commits what we think may be considered a misstep explaining that since possible variables both on supply and demand side are countless, he only focused on those that until that moment were proved to be significant and accepting the bias coming from the exclusion of any other variable. The remarks we are going to expose now are two: first of all Shelton himself wrote few page before that his work wouldn't be biased for missing any variable²² and now he admits that a sort of error will always be present, and we can only accept how much big or small

²¹ One of the most common examples is openness to trade

²² *"tests which focus solely on one or even just a few of these variables almost surely suffer from omitted variables bias. The first purpose of this paper is to gather the prominent theories and test them collectively to avoid such bias"* (Shelton, 2007)

we want it to be; secondly choosing variables on the basis of results obtained by others makes this paper lacking of innovative power, even if it remains a milestone in government spending research.

Also his methodology for this work has something in common with ours, so is interesting to underline it. Data come from IMF Government Financial Statistics dataset which has two ways of classifying data: Economic Classification Of Government Expenditure (ECOG) or Classification Of the Functions Of the Government (COFOC). The first divides expenditure in capital versus current expenditures and then again goods and services versus transfers; the latter creates multiple shares reflecting the branches, or the functions of the government like defence, health, social security.

We now list all the seven variables that Shelton explored and analyzed in his work, then we will also report a brief summary of his findings enriched by the tables showing his econometric results.

DEMAND SIDE EXPLANATIONS

- Openness to trade
- Country size
- Fragmentation²³
- Income (Wagner's Law)
- Income inequality

SUPPLY SIDE EXPLANATIONS

- Political rights
- Institutions of Government

²³ We want to underline that the fragmentation, mostly the ethnic one, can have also supply side aspects because politicians could try to allocate resources in order to favour his group so to gain support from the belonging members

Central government expenditure: basic specification

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Total expenditure (central)	Education (central)	Healthcare (central)	Social security (central)	Public order and safety (central)	General public services (central)	Transport (central)	Defense (central)	Transfers (central)	Public goods (central)	Government consumption (central)	Wages and salaries (central)
Log(population)	-0.472 (0.588)	-0.303 (0.097)**	-0.213 (0.109)	0.020 (0.224)	-0.240 (0.057)**	-0.437 (0.132)**	-0.192 (0.070)**	0.056 (0.208)	0.382 (0.327)	-0.013 (0.517)	-1.279 (0.288)**	-0.967 (0.185)**
Fraction < 15	0.298 (0.143)*	0.028 (0.023)	-0.036 (0.024)	0.043 (0.050)	-0.047 (0.017)**	0.114 (0.038)**	0.096 (0.021)**	0.157 (0.054)**	0.003 (0.081)	-0.043 (0.159)	0.175 (0.071)*	0.037 (0.042)
Fraction 65+	1.585 (0.333)**	-0.072 (0.054)	0.079 (0.058)	1.049 (0.117)**	-0.051 (0.034)	0.059 (0.082)	0.135 (0.046)**	0.103 (0.119)	1.199 (0.185)**	0.886 (0.310)**	0.075 (0.162)	-0.211 (0.098)*
Log(per capita gdp)	-0.080 (1.139)	0.220 (0.189)	0.045 (0.203)	0.086 (0.418)	-0.070 (0.117)	-0.065 (0.275)	0.191 (0.151)	0.410 (0.402)	-0.744 (0.630)	-0.269 (0.169)	1.020 (0.554)	0.788 (0.342)*
Trade openness	0.067 (0.017)**	0.007 (0.003)**	0 (0.003)	-0.001 (0.006)	0 (0.002)	0.006 (0.004)	0.007 (0.002)**	0.011 (0.006)	0.001 (0.009)	0.009 (0.014)	0.023 (0.008)**	0.003 (0.005)
Open* OECD1975	0.019 (0.027)	0.002 (0.004)	-0.002 (0.005)	0.024 (0.009)*	-0.007 (0.002)**	0.005 (0.006)	0.006 (0.003)*	-0.005 (0.009)	0.058 (0.015)**	0.051 (0.021)*	-0.030 (0.013)*	-0.005 (0.008)
Ethnic fractionalization	-0.020 (0.039)	-0.011 (0.007)	-0.012 (0.008)	-0.007 (0.014)	0.004 (0.004)	-0.001 (0.009)	0.003 (0.005)	-0.017 (0.013)	-0.050 (0.021)*	-0.071 (0.035)*	-0.008 (0.018)	-0.004 (0.012)
Observations	448	379	378	365	212	377	371	358	420	207	419	400
Countries	101	92	92	90	80	92	91	90	98	76	98	96

Standard errors in parentheses.

*Significant at 5%, **significant at 1%.

Regressions include a constant.

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Local government expenditure: basic specification

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Total expenditure (local)	Education (local)	Healthcare (local)	Social security (local)	Public order and safety (local)	General public services	Transportation	Government consumption (local)	Wages and salaries (local)
Log(population)	0.412 (0.328)	0.179 (0.108)	0.092 (0.087)	0.05 (0.119)	0.062 (0.026)*	0.043 (0.033)	-0.037 (0.055)	0.509 (0.235)*	0.443 (0.156)**
Fraction < 15	-0.103 (0.059)	0.019 (0.026)	0.019 (0.020)	0.022 (0.019)	0.003 (0.005)	-0.002 (0.008)	0.009 (0.017)	0.035 (0.056)	0.053 (0.040)
Fraction 65+	0.759 (0.148)**	0.322 (0.061)**	0.225 (0.047)**	0.262 (0.050)**	0.057 (0.011)**	0.076 (0.019)**	0.025 (0.034)	0.896 (0.130)**	0.583 (0.090)**
Log(per capita gdp)	-1.168 (0.540)*	0.108 (0.213)	0.013 (0.166)	0.204 (0.183)	0.010 (0.044)	-0.031 (0.066)	0.153 (0.115)	-0.150 (0.450)	-0.036 (0.307)
Trade openness	-0.026 (0.008)**	-0.001 (0.003)	0 (0.002)	-0.001 (0.002)	0 (0.001)	0 (0.001)	-0.005 (0.002)*	-0.003 (0.007)	0 (0.004)
Open* OECD1975	0.049 (0.015)**	-0.003 (0.005)	0.003 (0.004)	0.007 (0.005)	0.001 (0.001)	-0.001 (0.001)	0.003 (0.002)	0.018 (0.011)	0.015 (0.007)*
Ethnic fractionalization	0.012 (0.023)	0.026 (0.007)**	0.014 (0.006)*	0.017 (0.008)*	0.005 (0.002)**	0.003 (0.002)	-0.001 (0.004)	0.034 (0.015)*	0.020 (0.010)*
Observations	451	383	382	375	237	381	157	423	404
Countries	101	92	92	91	81	92	46	98	96

Standard errors in parentheses.

*Significant at 5%, **significant at 1%.

Regressions include a constant.

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²⁴ Tab. 3.6 Within estimators - central government – basic specification (Shelton, 2007)

²⁵ Tab. 3.7 Within estimators - local government – basic specification (Shelton, 2007)

Central government expenditure: extended specification

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Total expenditure (central)	Education (central)	Healthcare (central)	Social security (central)	Public order and safety (central)	General public services (central)	Transport (central)	Defense (central)	Transfers (central)	Public goods (central)	Government consumption (central)	Wages and salaries (central)
Log(population)	1.122 (1.005)	-0.246 (0.164)	0.310 (0.190)	0.145 (0.420)	-0.094 (0.080)	-0.241 (0.162)	-0.351 (0.110)**	0.448 (0.386)	0.766 (0.602)	0.700 (1.074)	-0.365 (0.495)	-0.390 (0.291)
Fraction <15	0.338 (0.212)	0.003 (0.029)	-0.052 (0.042)	0.189 (0.095)*	0 (0.018)	0.006 (0.037)	0.002 (0.026)	0.172 (0.087)*	0.114 (0.132)	0.134 (0.247)	0.295 (0.105)**	0.129 (0.038)*
Fraction 65+	1.981 (0.489)**	-0.202 (0.070)**	-0.087 (0.096)	1.349 (0.214)**	-0.006 (0.037)	-0.121 (0.084)	-0.030 (0.059)	0.224 (0.198)	1.620 (0.298)**	1.405 (0.496)**	0.309 (0.239)	-0.262 (0.134)
Log(per capita gdp)	-3.374 (2.192)	0.005 (0.307)	-0.381 (0.415)	-0.509 (0.988)	0.101 (0.172)	0.070 (0.361)	-0.243 (0.256)	-0.477 (0.852)	-2.745 (1.344)*	-3.301 (2.482)	-0.270 (1.090)	1.099 (0.601)
Trade openness	0.140 (0.035)**	0.009 (0.005)	0.011 (0.007)	0.018 (0.015)	0.001 (0.002)	0.001 (0.006)	0.005 (0.004)	0.029 (0.014)*	0.048 (0.022)*	0.060 (0.032)	0.052 (0.017)**	0.017 (0.009)
Ethnic fractionalization	0.055 (0.076)	-0.005 (0.013)	-0.027 (0.014)	0.001 (0.029)	0.009 (0.005)	0.009 (0.012)	0.020 (0.008)*	-0.012 (0.028)	-0.015 (0.045)	-0.038 (0.068)	0.005 (0.037)	0.002 (0.022)
Linguistic fractionalization	-0.090 (0.067)	-0.009 (0.011)	-0.024 (0.012)*	0.026 (0.026)	-0.008 (0.005)	-0.022 (0.010)*	-0.008 (0.007)	0 (0.025)	0.010 (0.039)	-0.016 (0.060)	-0.044 (0.033)	-0.037 (0.019)
Religious fractionalization	0.116 (0.066)	0.002 (0.011)	0.039 (0.012)**	0.033 (0.025)	0.009 (0.005)*	0.019 (0.010)	0.001 (0.007)	0.030 (0.024)	0.046 (0.039)	0.061 (0.064)	0.031 (0.033)	0.00 (0.020)
Gini	0.285 (0.182)	0.034 (0.025)	-0.011 (0.036)	0.201 (0.084)*	-0.020 (0.014)	0.040 (0.032)	-0.024 (0.023)	-0.100 (0.075)	0.231 (0.112)*	0.137 (0.197)	-0.035 (0.089)	0.041 (0.048)
Political rights	23.187 (9.514)*	2.367 (1.225)	-0.062 (1.828)	12.002 (4.262)**	-1.799 (0.760)*	1.647 (1.626)	-0.758 (1.187)	-3.605 (3.796)	19.464 (5.862)**	9.676 (10.457)	-1.163 (4.630)	4.043 (2.479)
Gini* political rights	-0.555 (0.231)*	-0.042 (0.030)	0.022 (0.044)	-0.271 (0.102)**	0.034 (0.017)*	-0.042 (0.039)	0.021 (0.029)	0.043 (0.091)	-0.433 (0.142)**	-0.167 (0.235)	0 (0.112)	-0.099 (0.060)
Majoritarian	-7.063 (3.960)	-1.175 (0.664)	-0.616 (0.728)	-4.395 (1.520)**	-0.102 (0.255)	-0.807 (0.615)	-0.877 (0.412)*	-1.802 (1.466)	-5.249 (2.353)*	-8.052 (3.426)*	-0.714 (1.959)	-0.414 (1.161)
Presidential	-7.185 (3.975)	-2.021 (0.662)**	-0.612 (0.737)	-1.404 (1.538)	-0.221 (0.312)	-1.981 (0.624)**	-1.274 (0.425)**	-1.560 (1.486)	-3.681 (2.330)	-10.099 (4.159)*	-3.149 (1.931)	-2.546 (1.129)*
Majoritarian* presidential	7.464 (7.239)	1.808 (1.228)	0.257 (1.307)	3.100 (2.686)	0.029 (0.452)	1.274 (1.098)	1.491 (0.736)*	4.306 (2.623)	5.610 (4.219)	8.965 (5.946)	3.487 (3.576)	2.181 (2.059)
Federal	-3.089 (3.368)	-0.551 (0.592)	-0.483 (0.634)	-1.105 (1.348)	-0.619 (0.227)**	-0.584 (0.534)	0.119 (0.358)	0.031 (1.274)	-1.019 (1.968)	-2.81 (3.000)	-0.502 (1.643)	-1.411 (0.982)
Observations	168	151	151	145	90	151	146	150	164	89	164	158
Countries	44	42	42	41	32	42	41	42	43	31	43	42

Standard errors in parentheses.

*Significant at 5%, **significant at 1%.

Regressions include a constant.

Central government expenditure; basic specification; between estimator

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Total expenditure (central)	Education (central)	Healthcare (central)	Social security (central)	Public order and safety (central)	General public services (central)	Transport (central)	Defense (central)	Transfers (central)	Public goods (central)	Government consumption (central)	Wages and salaries (central)
Log(population)	-0.315 (0.745)	-0.216 (0.118)	-0.258 (0.139)	-0.076 (0.277)	-0.250 (0.063)**	-0.365 (0.150)*	-0.201 (0.076)**	0.330 (0.230)	0.664 (0.401)	0.198 (0.570)	-0.973 (0.355)**	-0.768 (0.232)**
Fraction <15	0.643 (0.328)	0.163 (0.051)**	0.039 (0.061)	-0.197 (0.114)	-0.044 (0.028)	0.076 (0.065)	0.049 (0.033)	0.245 (0.095)*	-0.107 (0.180)	0.019 (0.262)	0.428 (0.160)**	0.198 (0.102)
Fraction 65+	1.937 (0.630)**	0.101 (0.098)	0.161 (0.116)	0.676 (0.217)**	-0.089 (0.049)	0.021 (0.125)	0.099 (0.063)	0.237 (0.182)	1.010 (0.338)**	0.980 (0.456)*	0.542 (0.300)	-0.019 (0.194)
Log(per capita gdp)	2.153 (1.628)	0.469 (0.267)	0.477 (0.314)	-0.496 (0.605)	0.099 (0.147)	-0.183 (0.339)	-0.180 (0.172)	1.525 (0.490)**	-0.067 (0.893)	0.492 (1.367)	1.905 (0.797)*	1.278 (0.510)*
Trade openness	0.065 (0.026)*	0.013 (0.004)**	0.002 (0.005)	-0.002 (0.009)	0 (0.002)	0.006 (0.005)	0.004 (0.003)	0.014 (0.008)	0.013 (0.014)	0.017 (0.019)	0.030 (0.013)*	0.011 (0.008)
Open * OECD1975	-0.001 (0.033)	0.005 (0.005)	-0.006 (0.006)	0.027 (0.011)*	-0.008 (0.003)**	0.005 (0.006)	0.011 (0.003)**	-0.014 (0.009)	0.047 (0.017)**	0.052 (0.024)*	-0.043 (0.016)**	-0.006 (0.010)
Ethnic fractionalization	-0.025 (0.042)	-0.017 (0.007)*	-0.012 (0.008)	-0.002 (0.016)	0.002 (0.004)	0.001 (0.009)	0.003 (0.005)	-0.001 (0.013)	-0.034 (0.022)	-0.060 (0.036)	-0.006 (0.020)	-0.011 (0.013)
Countries	101	92	92	90	80	92	91	90	98	76	98	96

Standard errors in parentheses.

*Significant at 5%, **significant at 1%.

Regressions include a constant.

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Local government expenditure: basic specification: between estimator

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Total expenditure (local)	Education (local)	Healthcare (local)	Social security (local)	Public order and safety (local)	General public services (local)	Government transportation (local)	Consumption (local)	Wages and salaries (local)
Log(population)	0.821 (0.467)	0.082 (0.132)	0.033 (0.109)	0.015 (0.165)	0.038 (0.031)	0.024 (0.040)	-0.016 (0.064)	0.266 (0.284)	0.284 (0.180)
Fraction <15	-0.073 (0.205)	-0.116 (0.058)*	-0.061 (0.048)	0.015 (0.070)	-0.002 (0.013)	-0.032 (0.017)	-0.018 (0.027)	-0.145 (0.128)	-0.037 (0.079)
Fraction 65+	0.773 (0.395)	0.038 (0.110)	0.021 (0.091)	0.142 (0.133)	0.016 (0.024)	0.005 (0.033)	0.002 (0.052)	0.324 (0.241)	0.269 (0.151)
Log(per capita gdp)	0.825 (1.019)	-0.197 (0.298)	-0.191 (0.246)	0.262 (0.366)	0.084 (0.071)	-0.100 (0.090)	0.259 (0.137)	-0.268 (0.638)	-0.023 (0.395)
Trade openness	-0.016 (0.017)	-0.004 (0.005)	-0.002 (0.004)	-0.003 (0.006)	-0.001 (0.001)	-0.001 (0.001)	-0.005 (0.003)	-0.012 (0.010)	-0.006 (0.006)
Open*OECD1975	0.032 (0.021)	-0.003 (0.006)	0.006 (0.005)	0.004 (0.007)	0.001 (0.001)	0 (0.002)	0.005 (0.002)*	0.017 (0.012)	0.013 (0.008)
Ethnic fractionalization	0.040 (0.026)	0.021 (0.008)**	0.008 (0.006)	0.006 (0.009)	0.003 (0.002)	0.001 (0.002)	0.007 (0.004)	0.015 (0.016)	0.008 (0.010)*
Countries	101	92	92	91	81	92	46	98	96

Standard errors in parentheses.

*Significant at 5%, **significant at 1%.

Regressions include a constant.

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28 Tab. 2.5 Between estimators – local government – basic specification (Shelton, 2007)

Central government expenditure extended specification: between estimator

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Total expenditure (central)	Education (central)	Healthcare (central)	Social security (central)	Public order and safety (central)	General public services (central)	Transport (central)	Defense (central)	Transfers (central)	Public goods (central)	Government consumption (central)	Wages and salaries (central)
Log(population)	2.016 (1.585)	0.059 (0.278)	0.741 (0.293)*	0.425 (0.597)	-0.188 (0.105)	-0.144 (0.251)	-0.171 (0.145)	0.742 (0.539)	1.231 (0.919)	1.111 (1.378)	-0.074 (0.732)	0.167 (0.456)
Fraction <15	0.918 (0.566)	0.152 (0.100)	0.070 (0.105)	-0.174 (0.210)	0.043 (0.038)	-0.064 (0.090)	-0.033 (0.054)	0.523 (0.194)*	0.205 (0.325)	0.128 (0.500)	0.588 (0.259)*	0.124 (0.157)
Fraction 65+	2.614 (1.006)*	0.066 (0.188)	-0.005 (0.198)	0.742 (0.395)	0.022 (0.078)	-0.172 (0.170)	0.023 (0.101)	0.695 (0.365)	0.900 (0.582)	0.491 (1.047)	1.462 (0.463)**	0.276 (0.302)
Log(per capita gdp)	0.180 (3.883)	0.238 (0.700)	-0.094 (0.738)	-1.211 (1.602)	-0.076 (0.304)	0.053 (0.632)	-0.557 (0.375)	3.432 (1.359)*	0.750 (2.316)	4.607 (4.678)	0.013 (1.846)	-0.215 (1.132)
Trade openness	0.177 (0.078)*	0.026 (0.013)	0.032 (0.014)*	0.035 (0.028)	-0.002 (0.004)	0.006 (0.012)	0.015 (0.007)*	0.020 (0.026)	0.045 (0.045)	0.053 (0.057)	0.066 (0.036)	0.053 (0.022)*
Ethnic fractionalization	0.043 (0.081)	-0.004 (0.014)	-0.029 (0.015)	-0.018 (0.031)	0.007 (0.006)	0.009 (0.013)	0.009 (0.008)**	0.011 (0.028)	-0.063 (0.048)	-0.052 (0.075)	0.053 (0.038)	0.027 (0.023)
Linguistic fractionalization	-0.092 (0.098)	-0.005 (0.017)	-0.041 (0.018)*	0.013 (0.037)	-0.011 (0.007)	-0.018 (0.016)	-0.018 (0.009)	0.008 (0.033)	0.045 (0.056)	0.003 (0.096)	-0.059 (0.045)	-0.056 (0.027)
Religious fractionalization	0.144 (0.072)	0 (0.013)	0.041 (0.013)**	0.020 (0.027)	0.014 (0.005)*	0.015 (0.011)	0 (0.007)	0.031 (0.025)	0.026 (0.041)	0.087 (0.068)	0.043 (0.033)	0.001 (0.020)
Gini	-0.159 (0.729)	0.057 (0.130)	-0.131 (0.137)	0.492 (0.274)	0.002 (0.051)	0.045 (0.117)	-0.061 (0.068)	-0.493 (0.252)	0.853 (0.424)	0.845 (0.674)	-0.742 (0.337)*	-0.315 (0.203)
Political rights	-17.253 (41.358)	1.103 (7.214)	-3.199 (7.601)	31.747 (15.192)*	0.562 (2.747)	-1.054 (6.516)	-2.293 (3.790)	-30.593 (13.923)*	60.645 (23.745)*	50.000 (36.253)	-54.469 (18.918)**	-23.625 (11.364)*
Gini * political rights	0.251 (0.855)	0.008 (0.148)	0.108 (0.156)	-0.731 (0.312)*	-0.031 (0.058)	0.032 (0.134)	0.045 (0.076)	0.572 (0.287)	-1.276 (0.491)*	-1.136 (0.772)	1.098 (0.391)**	0.517 (0.235)*
Majoritarian	-9.563 (4.817)	-1.292 (0.833)	-0.340 (0.878)	-2.636 (1.758)	-0.257 (0.284)	-0.826 (0.752)	-0.369 (0.446)	-1.561 (1.616)	-4.143 (2.763)	-7.647 (3.767)	-1.244 (2.201)	-0.259 (1.310)
Presidential	-10.504 (5.333)	-2.130 (0.940)*	-0.003 (0.990)	0.583 (1.985)	-0.539 (0.390)	-2.003 (0.849)*	-0.527 (0.504)	-0.933 (1.825)	-2.341 (3.082)	-4.939 (5.414)	-4.020 (2.455)	-2.168 (1.449)
Majoritarian * presidential	10.100 (8.376)	1.879 (1.438)	0.492 (1.515)	0.351 (3.029)	0.666 (0.535)	0.848 (1.299)	0.973 (0.766)	3.038 (2.790)	2.039 (4.838)	2.036 (7.300)	4.880 (3.855)	2.499 (2.281)
Federal	-3.335 (3.619)	-0.646 (0.644)	-0.459 (0.679)	-1.465 (1.429)	-0.409 (0.247)	-0.706 (0.582)	0.133 (0.346)	-1.311 (1.250)	-3.234 (2.077)	-7.699 (3.480)*	-0.007 (1.655)	-0.955 (1.009)
Countries	44	42	42	41	32	42	41	42	43	31	43	42

Standard errors in parentheses.

*Significant at 5%, **significant at 1%.

Regressions include a constant.

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Openness: If we assume that openness to trade implies more risks and higher volatility, we have to understand what governments do to fight back this effect. Data show that developed countries spend more and more in social security, infrastructure and wages at each level, and it easy to understand how this is fitting the more volatility hypothesis; developing countries, instead, show an increase but all over the spending categories and this aspect needs a different explanation. Shelton here propose another version of the ratchet effect, saying that developing countries face higher tax base volatility but it's easier for governments to increase spending than cut it. This process of continuous increases and the lack of corresponding cuts rises expenses, and since up

²⁹ Tab. 2.6 Between estimators – central government – extended specification (Shelton, 2007)

and downs are more common in open economies, this creates the correlation between openness and government spending.

Fractionalization versus country size: Data show a shift of expenditure between central government to local governments in some categories while there are no effect in others as long as countries are more fragmented. A second sight allow us to realize that categories in which the effect is stronger are education and healthcare; Easterly-Levine (1997) thought that taxpayers are more willing to pay taxes that are used mainly to help people of the same ethnic group and this is achieved increasing the role of local government or we could say fractionalizing expenses as much as the population. Shelton, on the other hand, suggests that since different ethnic groups belong usually to different social classes these are the true responsible for differences in tax allocation tastes, not the belonging to an ethnicity itself. This effect would be countered to the scale effect which implies that reducing spending fragmentation through centralization, total spending reduces thanks to economies of scale.

In some sectors like transportation and infrastructure, where social classes differ little in tastes, scale economies effect prevails, while in other sectors like education, is the fragmentation effect to prevail.

Income: It is the closest variable to Wagner's Law hypothesis and it has largely been proved to be strongly correlated to public expenses during past studies. Nevertheless in recent years the common idea is that the only link between income and expenditure is indirect: wealthier countries are also those with the oldest population and this requires higher spending in social securities; this expense would be so big that alone would be able to create a robust correlation between income and total level of spending. A second explanation, this time coming from the supply side, suggests

that richer countries are more efficient in tax collection because they can afford more complex tax systems and surveillance institutions, so improved revenues would justify higher expenditures.

Income inequality and political rights: About these values Shelton explains how his sample is heavily biased because of the paucity of data in developing countries against the abundance in developed ones. This makes his test more about how level of governments spending varies within democracies than how it varies across different regimes. Made these premises, what data suggest is that inequality has a negative effect over public spending because there is little interest for the decisive voter, if he is richer than the median one to empower redistribution function of the government³⁰

Institutions of government: majoritarian governments spend less than those elected under proportional system, while the choice of a presidential instead of a parliamentary systems has no effect over public expenses. Unfortunately Shelton gives no explanation to this phenomenon captured by data nor is he able to find support to either the thesis from Persson and Tabellini (1999) or Milesi-Ferretti, Perotti, and Rostagno (2002).

³⁰ This is the Benabou's hypothesis(1996) that Shelton seems to accept

4. Data Application

4.1 About the database

In this last chapter we are going to look for our own answer explaining the different levels of public expenditure across the world.

To do that we are going to select some data according to the ideas of the authors we showed before and then we will try to establish which, depending on our results, are the best hypothesis and which find no or little support.

The first step was the choice of the database from which we would choose our variables. The best we found and picked up is the “World Development Indicators” provided by the World Bank, which is actually an aggregator that shows both its own data and others coming from different databases like OECD, IMF and UN.

The choice of this dataset was made according to several factors: first it is available on the DBnomics website, which grants us the possibility to easily upload its datasets and elaborate them on Gretl, the econometric software we used to run our analysis; other reasons that made our choice fall on it are less technical, for example the World Bank and WDI are almost absolutely reliable and trustworthy, since the institutions that provide the data are some of the most important worldwide and widely used in economic literature.

The third point concerns the database structure that we want to build: since our intention is not to focus on a specific field, but on the contrary to use and test many and different hypotheses, we prefer to use a generic aggregator like WDI, which grants us a choice among 1429 different series and 217 countries, than a more specific database like the World Economic Outlook or the Government Finance Statistic, both provided by the International Monetary Fund.

Once we chose the databases we had to manipulate them in order to clear the data as much as possible, which means drop the countries that brought too little information so that they could be considered an encumbrance, select the years to consider for our panel dataset and the variables to include. The first operation was setting the time span on which we worked. For the We set it between 1972 and 2018. The reason was to take the range as big as possible in order to have enough data and we observed that no country had data about public expenditure going back beyond 1972, as for the other limit, we chose 2018 as the final year of the time series, although not all countries show updated data. Anyway the final result is a 46 years time interval for each country that we consider a satisfying result because should be enough to capture several business cycles but also a development of the economic structure like it happened with phenomena like globalization and the spread of internet; our data should be able to tell us how all these situations affected public expenditure.

Also the choice about the size of the sample was made trying to make it as wide as possible because we didn't like the idea of limiting the sample to only few countries like many authors did focusing on OECD countries. Our choice was made taking in consideration that the main advantage of focusing on developed countries is the higher abundance and higher reliability of data; but having we these features granted by the choice of databases, we preferred to include as many countries as possible in order not to lose any piece of information. The only countries that we deleted are those with so little data available to be, in the end worthless. Their elimination didn't affect negatively the results validity or robustness even though we have to point out that almost all the deleted countries belong to the developing countries area.

During the process of selection we realized that a considerable number of countries began to exist or, anyway, to collect data only during '90s either because their foundation followed the dissolution of the communist block or because they just began to collect data in that period.

This made us chose to run two regressions instead that only one: the first focusing on having the biggest sample possible considering the whole time interval, and a second one whose time series were limited to the last 23 years but giving more importance to cross sectional differences rather than temporal ones.

Now that we talked about the dimensions of our pane dataset, in the following paragraph we will explain how we filled it, which means we are going to talk of variables.

4.2 Variables presentation

As we saw in the second chapter³¹ there are several ways to define the “public expenditure” for our purpose we will use two different dependent variables trying to explain its causes: the first, and most important will be the variable EXPENSE, while a second and more specific variable will be focused on a share of all the general government expenses and we will call this second variable CONSUMPTION.

Having our main goals set, regarding the overall level of expenses and consumption, now we are going to set a secondary goal that is try to analyze the composition of EXPENSE splitting it in 5 shares and see if our regressors affect also this aspect.

Now we will briefly introduce more in detail all these variables

- EXPENSE: the EXPENSE variable is created by World Bank elaborating data from IMF, specifically the Government Finance Statistics Yearbook and other estimates like OECD and World Bank itself. Data are aggregated through the weighted average method on yearly base. The data that compose this variable are all the cash payments done by the central government and are expressed in local currency, so this amount is then divided by the GDP

³¹ See paragraph 2.2.1

of that country so to obtain a percentage value useful for comparison among different countries or periods.

In order to guarantee a higher trustworthiness of the data IMF before gathering them recommends to take account of all the stock changes so that the flows can be compared to the increases or decreases in stocks for a double check. Despite the efforts provided by IMF and other organizations data are aren't completely comparable yet, for example some countries account expenses over the fiscal year while the bulk of data are on calendar year base³².

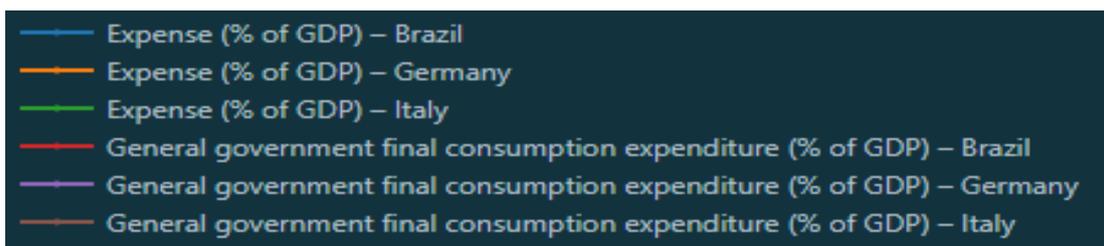
- CONSUMPTION: the CONSUMPTION variable is quite similar to the previous one from a methodological point of view, their constructions are actually analogous but there is one aspect on the theoretical side that we want to stress and that is basically the reason for our choice to include this variable.

CONSUMPTION is equal to EXPENSE minus interest payments and transfers, so it doesn't depend directly on financial aspects like interest rates this can be very relevant in some countries like is shown in the following figure.

In Fig 4.1 we can find three different examples in which our two main variables differ consistently so that is useful to use both of them. In the upper part, we can see that after 2001 EXPENSE and CONSUMPTION begin to diverge due to the constant increase of the former variable while the consumption keeps a flat trend. In the middle panel we can see a spike around 1990, likely because of the reunion of East and West Germany in one country, but this episode seems to affect only the EXPENSE variable while CONSUMPTION is only slightly affected; in the lower part of the image we find a different problem: in the second half of the 70s EXPENSE seems to begin to rise but we have a series of missing data which are not missing in the other variable.

³² We chose to drop all the countries having this feature for higher homogeneity of the observations

In the end we want to keep using EXPENSE as the main dependent variable because of it is more complete, reflecting all the aspects of public expenditure but, from a statistical point of view we have to keep in mind that, even because of its higher complexity, EXPENSE could be less reliable than CONSUMPTION³³



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³³ For a raw comparison we just note that CONSUMPTION has only 982 missing observation against the over 2000 of EXPENSE

³⁴ Fig 4.1 Brazil, Germany and Italy comparison between EXPENSE and CONSUMPTION trends.

- GOODS&SERVICES - INTEREST PAYMENTS - SUBSIDIES&TRANSFERS - COMPENSATION OF EMPLOYEES – OTHER: These are the components EXPENSE is made of and are expressed as percentages of the total EXPENSE; this would imply that their sum is equal to 100% but because of errors in data gathering, transmission and elaboration this happens few times, despite the presence of the OTHER variable that is a residual where all the expenses that can't be allocated in any other category are inserted.

After the dependent variables it is time to move on to the dependent variables

- GDP: The variable we took to catch the effect of income on public expense is the per capita gross domestic product based on purchasing power parity and expressed in constant 2011 international dollars. This choice isn't optimal to test the original Wagner's law as we discussed in paragraph 2.2.1, but it is the most suitable for our situation in which we have many countries with different income and population values. Data are collected by the World Bank in the International Comparison Program database.
- GINI: The GINI variable is nothing but the Gini index and has been chosen as a way to show the effect of the supply side on the total level of public expenditure. The idea is that the Gini index expresses the income inequality of a country, so we expect it to be positively correlated with our dependent variables because higher values of GINI mean more inequality and a higher interest of the median voter to sustain politics that increase public expense through transfers and redistribution. Our expectancies about it are to be more relevant when regressing EXPENSE than CONSUMPTION and, most of all, to be significant in SUBSIDIES&TRANSFERS while having little or no relevance in the other cases.
- TAX REVENUE: This value is calculated as the total revenue collected by central government through taxes divided by its GDP. The idea is that a more efficient fiscal system, or a smaller tax evasion can allow countries to spend more, but this variable on its

own doesn't provide us a complete perception of this aspect, so we should include another variable, the marginal tax rate, as a control because a country with a higher tax revenue and a higher public expenditure may just be more burdensome for its citizens, setting higher tax rates without being more efficient; the problem is, as discussed in Easterly – Rebelo (1993) that this value is only an idea and can't be directly measured, and even if it can be substituted through proxies, like they did in their paper, there are no guarantees about the efficacy of the process, so we preferred to keep the our variable but being aware of the little reliability it has. Anyway we may find out this variable having no correlation with the public expenditure and that would be an evidence that the total level of government expenses is pulled more by the demand side than the supply.

- NETFDI&TRADE: We put together these two variables because we use to proxy the same characteristics, the openness of a country toward global economy. Except for the common scope these variables don't share any other feature, in fact while the TRADE variable is a dataset available between the WDIs and it is the sum of import and exports on GDP, the NETFDI is a variable that we created following a similar idea.

We took from the World Bank database two variables: "Foreign direct investment, net inflows" and "Foreign direct investment, net outflows", both expressed as a share of GDP; then we applied the absolute value function to our data in order to avoid negative values and then we summed the two variables. The idea is that both inflows and outflows contribute to make a country more open, no matter the direction of the investment.

Our expectation about these variables is that openness should be positively correlated with public expenditure.

- POPULATION: This variable is closely related to the previous one since we included it only as a proxy for country size as it is said in Alesina-Wacziarg paper that country size reduce

openness and openness increases public expenditure we should expect POPULATION to have a negative relation with our dependent variables. Problem is that Alesina-Wacziarg point is far more complex and would require both more accurate measures on country size and on ethnic fractionalization of the population, yet we believe that we can obtain a fading clue by introducing this variable while all the other factors we just discussed would divert our work from its goal.

- **DEPENDENCY RATIOS:** In this category we have three different, but very closely related, variables. The dependency ratio represents the percentage of dependents people, that is people under 15 and over 65, respect to the working-age population. The idea is that most of the public expenses are directed to education, health and pensions which are aspects more important for young and old people, so the expectation is to be positively correlated with our main dependent variable. Furthermore we are interested in three more tests about the dependency ratio. The first is to check if the Wagner's law can be explained through the dependency ratio, if this is true including this new variable should absorb almost the whole effect of income on public expenditure, as noticed by Shelton (2007); the second test concerns the other two ratios which are DEPENDENCY RATIO OLD and DEPENDENCY RATIO YOUNG which show the former the percentage of over 65, and the latter the percentage of under 15 respect to the working-age population.

4.3 Methodology and Results

In the following pages and table we will present the outcomes of our regressions, given the database and the datasets that we showed in the previous chapters, but before moving to the final part we want to explain the procedure that allowed us to obtain it.

After removing all the countries too small or too scarce of data to be relevant and also having set the time period in which we find values, we obtained a dataset that we chose to analyze through a panel structure, which means that cross sections and time series are taken into account at the same time.

Initially we will regress data through the Fixed Effects (FE) model, which is one of the simplest estimators for panel data, but it also rises some problems that now we will discuss. The key assumption of FE is that there are features of the cross sectional elements that are constant over time but still influence somehow the dependent variable; just to make an example related to our data, exist endemic features of countries like past history events or traditions which persist and are hard to change in the short or also medium period that explain part of the public expenditure level but this effect is not caught by the selected variables. If we used a pooled OLS model these effects would end up in the errors but the FE claims that, since as assumption, these effects are always present for each cross sectional element, the error component can be split in two components: one time invariant that is the fixed part we were talking about, and an observation specific error that changes with each observation.

In formulae we would pass from the model expressed by $y_{it} = X_{it}\beta + u_{it}$ to $y_{it} = X_{it}\beta + \alpha_i + \varepsilon_{it}$ ³⁵. What we just said is that u_{it} , the error component of the model, under the assumption of fixed effects, can be transformed into $\alpha_i + \varepsilon_{it}$ it means, a time invariant component and an observation specific error.

³⁵ i expresses the cross section while t means time; so u_{it} , the errors that in pooled OLS change with each observation become α_i , a value that isn't affected by time but only by cross section, and ε_{it} the residual error that, like u_{it} is specific for each observation

The problem with FE we were mentioning before is that all the time invariant variables, especially dummies, will be considered as perfectly collinear with α_i and dropped from the regression; FE doesn't allow for any time invariant regressor.

This is for sure a heavy price to pay to use this model, yet we chose to do it anyway for two reasons: the first is that the selection is not a merely propensity choice, we believe that some fixed effects are luckily to be found in our sample while the best alternative to FE, the Random Effects, despite allowing us to include time invariant regressors, requires a further assumption of complete absence of correlation between explanatory variables and errors; the second reason for choosing FE is that our main goal are the regressors, any time invariant variable would be some extra knowledge to add to our core regression and anyway something that we can drop without compromising the whole work.

The following table refers to our core regression, using EXPENSE as the dependent variable, later on we will discuss the results and explain our following steps.

Tab 4.3.1 FE regression, dependent variable EXPENSE, robust standard errors ³⁶ between brackets					
	(1)	(2)	(3)	(4)	(5)
GDP	1.29307e-05 (1.88896e-05)	-2.89526e-05 (2.08102e-05)	3.44295e-05 (3.01015e-05)	-3.79926e-05 (2.07296e-05)*	0.000294302 (7.84474e-05)***
DEPENDENCY RATIO		-0.102023 (0.0131784)***	-0.130526 (0.0150240)***		-0.0699533 (0.0406185)*
DEPENDENCY RATIO YOUNG				5.00219e-09 (1.49163e-09)***	
DEPENDENCY RATIO OLD				-0.0912931 (0.0111177)***	
TRADE			-0.0515159 (0.00855206)***		-0.0345325 (0.0168977)**

³⁶ We chose to calculate the robust standard errors through the s Panel-Corrected Standard Error(PCSE) regressor

NETFDI			-0.0398014 (0.0164473)***		0.0105876 (0.0181319)
GINI					-0.209177 (0.0001)***

The first results, as illustrated in the table 4.3.1 are surprising and they show several critical issues. The first important aspect is that the GDP is found positively correlated with the EXPENDITURE variable only half the time we regress it, and almost never relevant showing *pvalues* below 10% only in regression (4) and below 1% in regression (5); about the DEPENDENCY RATIOS they show ambiguous results: the total DEPENDENCY RATIO, which in Shelton had the effect to absorb most of the GDP influence over the public expenditure levels, here is found correlated to our dependent variable but it shows a sign opposed to the one we could predict. The situation doesn't even change when we introduce the TRADE and the NETFDI variables; with them the DEPENDENCY RATIO keeps being negative but still strongly correlated, having a 99% accuracy value, but this situation changes again when we try to include also the GINI index: the DEPENDENCY RATIO loses part of its significance (90%) but the sign keeps being negative.

About the other two ratios, DEPENDENCY RATIO OLD and DEPENDENCY RATIO YOUNG, accounting respectively for people over 65 and under 15, they show completely different results: despite both result meaningful (*pvalues* < 1%), the first one happens to be negatively related with total public expenditure, which is a surprise if we think to all the pensions and the medical provisions old people need, while the latter has a positive coefficient as expected. Anyway we are willingly to run more tests and regressions in order to find out whether the problem lies in our data, our model, or somewhere else, otherwise we will need a new explanation to link these surprising results.

The TRADE and NETFDI just like the GINI index are the most warringly results because they show negative coefficients while the literature always linked them to a positive effect over expenditure:

openness should bring governments to higher spending values either as a risk reduction procedure, as hypothesized by Rodrik, or as a side effect of country formation, as claimed by Alesina and Wacziarg. Yet there are some considerations to be done, for example Rodrik chose a different dependent variable, consumption, instead of expenditure while Alesina and Wacziarg focused more on the components of expenditure rather than the total; so in the next section we adapt our regression to look for confirmation of their results.

On the other side the GINI index has a structural problem to deal with: the scarcity of observations; of all the variables we used this far GINI is the one with the highest number of missing values; but even with this in mind its result is not comforting because the coefficient shows a negative sign that is hard to explain: a higher level of inequality (it means GINI values closer to 1) would require higher spending for social security and transfers from the State and vice versa; on the other hand the dependent variable we were regressing now was the total expenditure, later we will try to see if SUBSIDIES&TRASFERS will result positively and significantly related to our GINI variable, but before doing that or any other kind of test we will try to run the same regression but using our second dependent variable, CONSUMPTION.

Tab 4.3.2 FE regression, dependent variable CONSUMPTION, robust standard errors between brackets					
	(6)	(7)	(8)	(9)	(10)
GDP	-5.90580e-06 (1.03279e-05)	-5.01333e-07 (1.00352e-05)	7.07545e-06 (1.30472e-05)	-8.49359e-06 (9.91035e-06)	5.17287e-05 (2.95951e-05)*
DEPENDENCY RATIO		0.0131258 (0.00814190)	0.0128616 (0.00942962)		0.201485 (0.0668522)***
DEPENDENCY RATIO YOUNG				2.55239e-09 (7.13789e-010)***	
DEPENDENCY RATIO OLD				-0.00365495 (0.00815021)	
TRADE			0.00116920 (0.00429025)		0.00262272 (0.6126)
NETFDI			0.00193545 (0.00134869)		0.00221872 (0.00124393)*
GINI					0.0149391 (0.0213400)

The results reported in table 4.3.2 are quite different from the previous ones but no better for our research: the main differences are an overall loss of relevance of our variables in all the regressions except for (10) where GINI and NETFDI are the only regressors not to reach even the 95% significance level.

Despite model (10) looks as a quite good result with all the coefficients as expected and a sufficient level of significance, mostly thanks to the DEPENDENCY RATE, we can't ignore all the previous results and also the comparison with model number (5) whose outcome is not satisfying; for this reason, before looking for more specific effects of every single regressor, we preferred to try a different approach, another model with different characteristics.

Now we are going to redo the previous two tables using the Random Effects (RE) instead of the FE; also this time we are going to add some new dummies that we could not use previously for the reasons explained at the beginning of this paragraph. The dummies we are talking about are regional dummies, through which we will divide our sample in 7 areas assuming that close countries may share common history, or cultures, or political setups, or anything else that could explain similar public expenditure levels; the regions were chosen according to the World Bank, that also provides the data, so not to create discrepancies and are: East Asia and Pacific (EAP), Europe and Central Asia (ECA), Latin America and Caribbean (LAC), Middle East and North Africa (MENA), North America (NA), South Asia (SA), Sub-Saharan Africa (SSA).

Tab 4.3.3 RE regression, dependent variable EXPENSE, robust standard errors between brackets					
	(11)	(12)	(13)	(14)	(15)
GDP	2.17022e-05 (1.74547e-05)	-1.87496e-05 (1.93330e-05)	2.85409e-06 (2.21067e-05)	-2.37367e-05 (1.97996e-05)	0.000194267 (5.83897e-05)***
DEPENDENCY RATIO		-0.100524 (0.0145252)***	-0.113814 (0.0175831)***		-0.105855 (0.0326162)***
DEPENDENCY RATIO YOUNG				-2.25749e-09 (2.52607e-09)	
DEPENDENCY RATIO OLD				-0.0972738 (0.0139173)***	
TRADE			-0.0439863 (0.00983468)***		-0.00208630 (0.0125944)
NETFDI			0.00241579 (0.0182909)		0.0459154 (0.0127001)***
GINI					-0.151944 (0.0581567)***
EAP	-18.4550 (11.1686)*	-19.4224 (11.2029)*	-17.4672 (10.9042)	-20.4339 (10.8604)*	-8.18123 (3.10563)***
ECA	-3.36845 (11.3233)	-4.56394 (11.3490)	-3.10590 (10.8800)	-6.52212 (11.0183)	1.64049 (3.00563)
LAC	-16.0023 (11.6306)	-16.4773 (11.7260)	-15.9952 (11.4000)	-17.6386 (11.3616)	-3.56287 (2.73580)
MENA	-5.46404 (14.3202)	-5.88601 (14.1957)	(13.5052)*	-6.97421 (13.7838)	2.11022 (4.83745)
NAM	14.3202 (11.6090)	-18.1689 (11.5780)	-19.1901 (11.0457)	-19.5300 (11.2994)*	-13.8479 (4.25609)***
SA	-15.7048 (11.5987)	-14.4499 (11.4765)	-15.4406 (10.9689)	-16.3185 (11.2609)	-11.2611 (4.03343)***
SSA	-15.8027 (11.0452)	-14.4499 (11.1110)	-10.9543 (10.6140)	-15.2158 (10.8076)	omitted due to perfect collinearity

Tab 4.3.4 RE regression, dependent variable CONSUMPTION, robust standard errors between brackets					
	(16)	(17)	(18)	(19)	(20)
GDP	-1.00596e-06 (9.72854e-06)	3.46982e-06 (9.48411e-06)	7.13958e-06 (1.20973e-05)	-5.48639e-06 (9.54213e-06)	7.76613e-05 (2.56006e-05)***
DEPENDENCY RATIO		0.0109311 (0.00855908)	0.0115351 (0.0100890)		-0.0178927 (0.0140632)
DEPENDENCY RATIO YOUNG				-3.95130e-010 (9.64736e-010)	
DEPENDENCY RATIO OLD				-0.00922252 (0.00870017)	
TRADE			-0.000706208 (0.00395722)		-0.00410280 (0.00461862)
NETFDI			0.000743812 (0.00141413)		-0.00233914 (0.00117529)**
GINI					0.0282449 (0.0235057)
EAP	-7.42094 (9.77437)	-7.33028 (9.73863)	-7.21865 (10.2122)	-7.59860 (9.40558)	-4.86469 (1.79629)***
ECA	-1.94622 (9.86993)	-1.82244 (9.81781)	-1.64075 (10.1826)	-2.25165 (9.51638)	-0.895050 (1.97587)
LAC	-6.96340 (10.8259)	-6.93111 (10.7784)	-6.51711 (10.9663)	-7.10355 (10.3973)	-5.20295 (2.06042)**
MENA	-3.51482 (8.69528)	-3.45447 (8.68802)	-3.24266 (9.17134)	-3.66995 (8.34753)	-0.784963 (2.76611)
NAM	-2.54849 (10.3980)	-2.48334 (10.3271)	-2.37656 (10.7701)	-2.72293 (10.0663)	-3.18084 (2.71458)
SA	-8.89932 (10.0725)	-8.90362 (10.0277)	-10.5302 (10.4571)	-8.89282 (9.74838)	-8.38561 (3.62276)**
SSA	-2.56061 (9.27538)	-2.70278 (9.20669)	-1.30260 (9.43937)	-2.52114 (8.91385)	omitted due to perfect collinearity

Tab 4.3.3 and even more Tab 4.3.4 show a sound similarity with the previous ones, especially in the fact that the only regressions with good and more reliable results are (15) and (20) just like we saw this happening looking at (5) and (10); actually what makes these regressions different from the others is the inclusion of the variable GINI that heavily reduces the sample: (5), (10), (15) and (20) are build on 800-900 observations while all the others have more than 2000. We can assume that the missing values are not distributed and that focusing on developed countries may lead to a different result because most of the studies we analysed in chapter 3 used smaller samples than our.

In order to be sure that the cause of our problem should be searched in the data instead of in the model as we did until now we will use three tests: the joint significance of differing group test, the Breusch-Pagan test and the Hausman test; respectively comparing Pooled OLS and FE, Pooled OLS and RE, FE and RE.

```
Joint significance of differing group means:  
F(87, 810) = 28.1712 with p-value 3.90374e-191  
(A low p-value counts against the null hypothesis that the pooled OLS model  
is adequate, in favor of the fixed effects alternative.)
```

```
Breusch-Pagan test statistic:  
LM = 2540.83 with p-value = prob(chi-square(1) > 2540.83) = 0  
(A low p-value counts against the null hypothesis that the pooled OLS model  
is adequate, in favor of the random effects alternative.)
```

```
Hausman test statistic:  
H = 9.98578 with p-value = prob(chi-square(4) > 9.98578) = 0.0406678  
(A low p-value counts against the null hypothesis that the random effects  
model is consistent, in favor of the fixed effects model.)
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So the Hausman test just confirmed what we already imagined: FE is the best model for our necessities, so it should be useless to attempt with its competing models, it wouldn't improve our results. At this point the only possibilities left are to modify our data and check if their

³⁷ Fig 4.2 Our results with the test to choose the best model for our regressions

improvement can bring a satisfying outcome, or to look for a different theoretical explanation that can justify why public expenditure doesn't look linked to any of the variables that are expected to affect it.

Our next step will be the creation of new subsamples of our dataset and then we will make the same regression as before and see if there will be changes in the results; the sampling will affect the two aspects of the panel because once we will try to reduce the time span and take only the most recent years, where there are less missing values, and the second time we will reduce the cross sections, selecting only the OECD countries.

As we explained in paragraph 4.1, the reduction of the sample by time should make it more balanced for two reasons: firstly because as time passed more States cared about data collection and transmission, so we have more data than in the past; secondly the cross sectional dimension accounts 109 elements but several of them didn't exist earlier than '90s, and all the observations regarding those years are automatically considered missing values, affecting the final result of the regression.

The reduced sample begins in 1993 and accounts for 2725 observations.

For the sake of brevity we won't report here all the results³⁸, and we will just summarize them here. The sample reduction didn't change almost any of the results with the coefficients changing signs according to the inclusion or exclusion of lags and variables, and still the inclusion of GINI turns the result very close to the expected ones, but still it must be a weak and insufficient clue.

Actually the observation used for the regression in this sample are very close to those that produced results in Tab 4.3.1 because, as we said before, most of the missing values belong to the oldest years, so this outcome is not surprising.

³⁸ anyway they are present in the appendix, Tab A.1

And also a further reduction to the last 10 years has the same effect. Our data show the same trend over time, so now we will look if a sampling on geographical base will change the situation.

The results of the regressions are contained in Tab A.2 and they tell us that even the restriction of the sample to the 35 OECD countries didn't produce very different outcomes respect to the previous tests.

Having done everything we could to be sure that the values contained in Tab 4.3.1 and Tab 4.3.2 aren't produced by some mistakes in the econometric procedure or the sampling, we can now claim that our data don't support almost any of the theories contained in chapter 2: they don't support the Wagner's Law because we didn't find a positive and relevant relation between EXPENSE and GDP, not when regressed alone, nor when we introduced control variables. The explanation of this surprising outcome lies probably in the definition we used to express the public expenditure: since its values are percentages calculated by dividing the total amount of expenses by the Country's GDP, it's obvious that, if expenses don't adjust as quickly as the GDP variations, EXPENSE is likely to be negatively related with GDP; of course the correlation is not complete because the numerator of this division, the public expenditure, is not constant but it also changes over time.

Slightly different speech is needed for the DEPENDENCY RATIO variable: it was almost always relevant to the variable EXPENSE, while it isn't interrelated with CONSUMPTION. The implication of this result is that the bigger is the part of people above 65 years or below 15, the less the central government sustain expenses. This is the opposite of what Shelton suggested because young and old people are those who need more healthcare and education, and he supposed their presence would boost the system but, from our perspective, they are also those who don't support the system because they don't pay taxes, especially under 15 people; so the government

may reduce the total expense in countries where the bulk of people don't work because of a lack of resources.

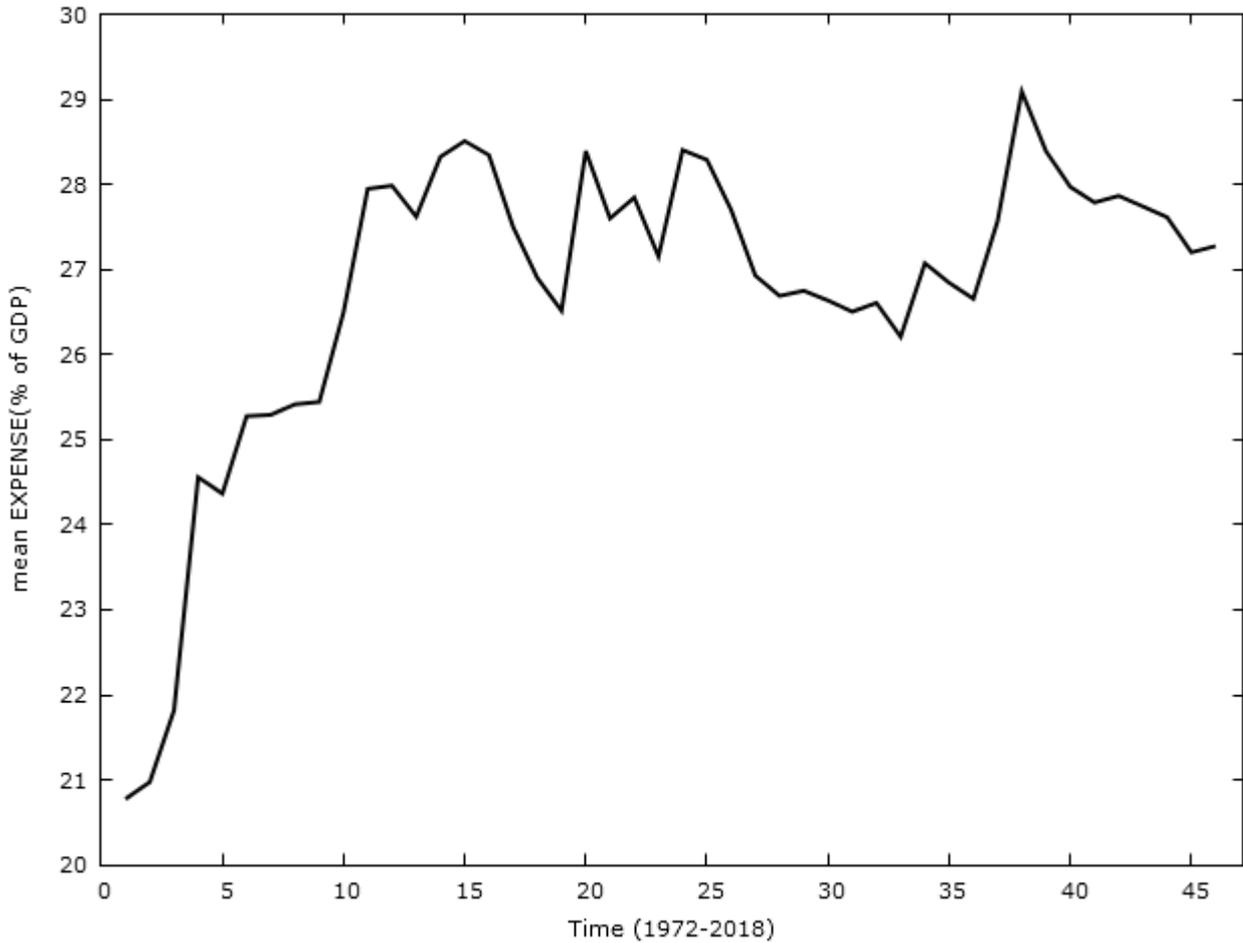
About openness, that we proxied through the two variables TRADE and NETFDI, we found evidence of support to the hypothesis of negative relation just like Garret and Mitchell (2001) did in their work, especially for the variable TRADE that is the very same they used. Given this satisfactory result as a starting point we wanted to discover if our data fully supported the efficiency hypothesis, according to which the reduction of expense should affect mainly welfare and transfers. In order to control we will regress SUBSIDIES&TRANSFERS on TRADE and NETFDI, but the outcome of (21) shows a positive (and relevant) relation between the two variables, so the cut has to happen in some other components of EXPENSE³⁹.

We can now move on to the GINI variable that, as we said previously, should be positively related with SUBSIDIES&TRANSFERS; this situation is not supported by our data⁴⁰ but an explanation could be the high weight of European countries over the regression: respect to the world average these States have a low Gini index and at the same time high expenditures for subsidies and transfers.

³⁹ TRADE actually results negatively related to GOODS&SERVICES, INTEREST PAYMENTS, SUBSIDIES&TRANSFERS, COMPENSATION OF EMPLOYEES

⁴⁰ According to regression (22) lower levels of GINI correspond to higher subsidies expenditure, with a coefficient of -0.249465

4.4 Public expenses over the world through graphics

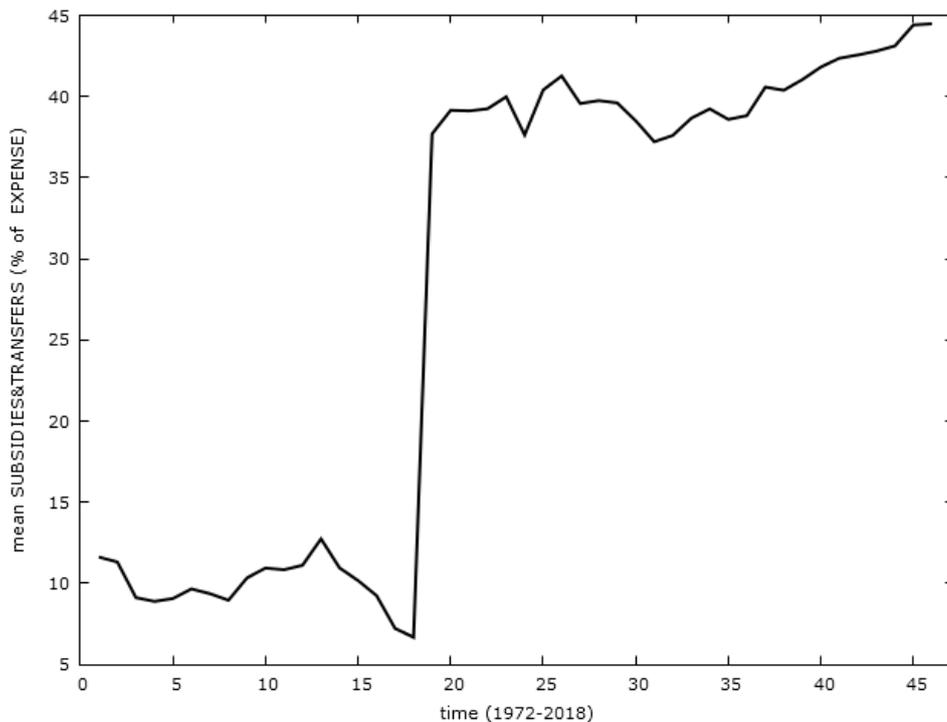


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In Fig 4.3 we can appreciate the evolution of the dependent variable EXPENSE between 1972 and 2018. The first thing noticed is the sharp increase that happens in the first 12 years: the average expense increased almost of the 33% and then reached a level quite constant until it reached a even higher peak in 2008. One feature shared by all the '70s and the years between 2008 and 2010 is that both were periods of crises; this would suggest the use by governments of public expenditure as a countercyclical tool to contrast economic crises and protect, at least partially, people. On the other hand our variable is expressed as a percentage of GDP so its contraction, together with an hypothesis of EXPENSE inelasticity, could also explain the y-axis increase; in order

⁴¹ Fig 4.3 World mean EXPENSE evolution over the time period analysed

to find out which of these two effects prevails we will plot all the different components of EXPENSE: if SUBSIDIES&TRANSFERS follows the same path, the countercyclical function would be confirmed.

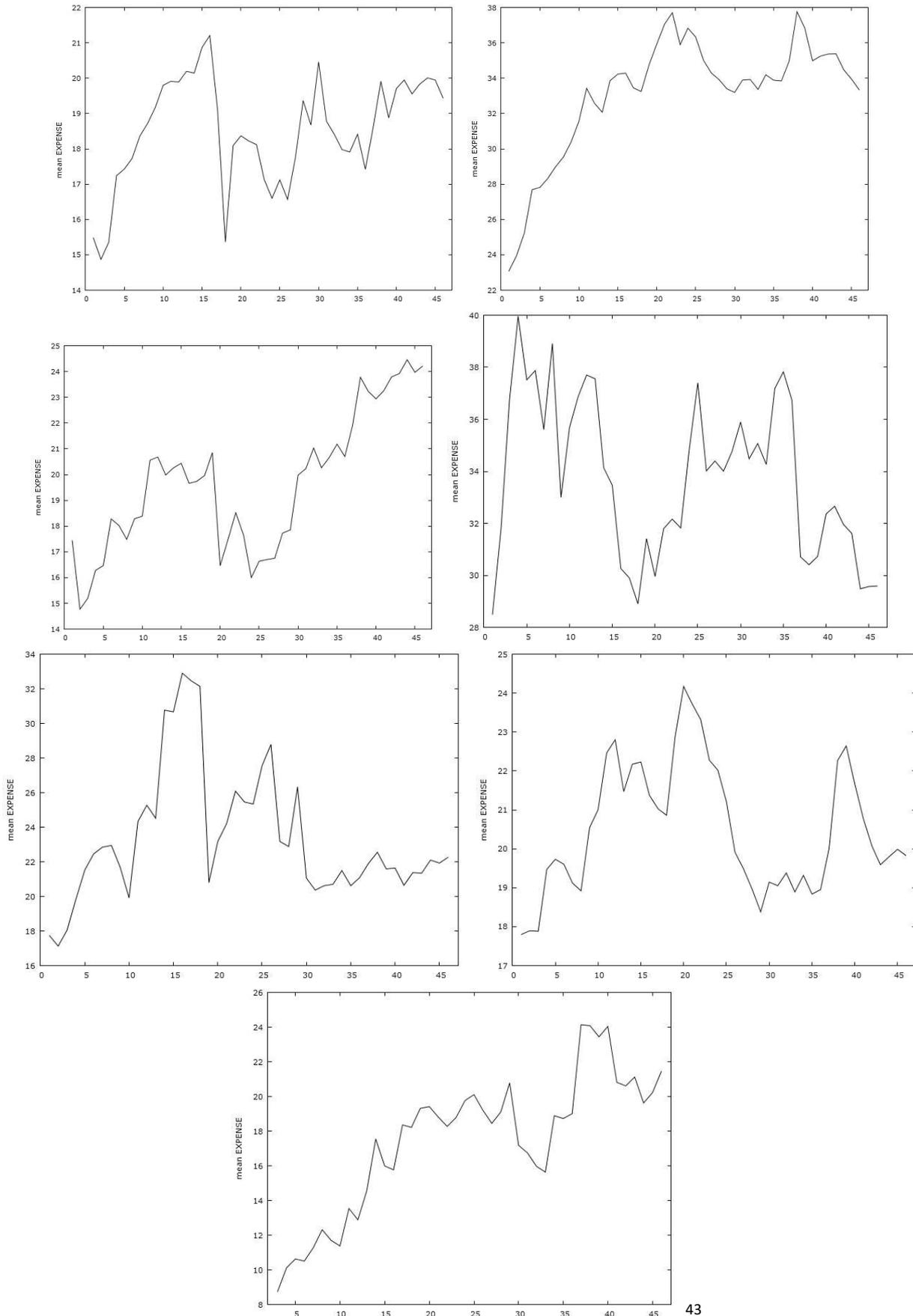


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As evident from Fig 4.4, SUBSIDIES&TRANSFERS didn't increase during '70s and also we don't notice a peak around 2008, so probably its path is not related to the business cycle or the crises, actually except for a huge jump in 1990 (more probably due to a difference in the accounting system that an effective increase in real values) our variable looks quite constant in its values, so the GDP contraction as the main explanation, even if probably not the only one, of Fig. 4.3 becomes more likely.

Another interesting aspect would be to compare different regions in order to see if there are differences in trends or values across continents.

⁴² Fig. 4.4 World evolution of SUBSIDIES&TRANSFERS over time (1972-2018)



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⁴³ Fig 4.5 From top to bottom: EAP, ECA, LAC, MENA, NAM, SA, SSA

There are several interesting aspects that can be obtained looking at Fig 4.5, for example just looking at the intervals of the y-axes we can see how they change across regions: in EAP countries, as an average, EXPENSES never trespassed 22% of GDP while in ECA countries the maximum level is near 40%.

We can also obtain a further proof of the relation between crises and EXPENSE: in sub Saharan countries, where the crises caused a relatively smaller reduction, we don't appreciate the same increase as in North American or in European countries.

5. Conclusion

The main deduction that should pass thanks to this work is that the study of government's expenditure is very complex and multifaceted, so that is hard to find solid bases for future research.

From a theoretical point of view the multiplicity of theories and hypotheses that we explained in chapter two are a proof of the possible direction that scholars followed and still follow in order to find the explanation, or even better the explanations, to our topic and problem. One of the few certainties we obtained from this work is that there can't be a unique solution to complex problems like the level of public expenditure so that all the hypotheses should not be thought as alternatives, but like if each of them contributes to shed some light on one aspect of the mystery.

As an example, Wagner's Law is not excluding Baumol's Law or ratchet effect, and is even more evident that while all these theories explain drivers of public expenditure demand, on the other side is important to study how governments and politicians behave because they are those who actually choose the total level of expenditure and its allocation.

More problems arise when we realize that our main tool to determine which theories are worthier to be explored, we mean econometrics, is not very efficient in this field. The obstacles to the use of econometrics are of different kinds: some theories are hard to be tested through numerical values, like all those that focus on the median voter as a driving factor of tax policies and later public expenditure; others face more technical problems like correlation among explanatory variables (Shelton, 2007).

And having in mind this last point we should judge the results of our work; the fact that we found little or no support for some of the most common theories should not be seen as a failure of our

data and tests, but as a proof of the complexity of this topic and on the other hand the possibility of new studies, especially on the influence of the dependency ratio over public expenditures.

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Appendix

Countries grouped by region

EAST ASIA and PACIFIC: Australia, Cambodia, Fiji, Indonesia, Japan, Korea, Macao, Malaysia, Mongolia, New Zealand, Papua New Guinea, Philippines, Singapore, Thailand (Total 14)

EUROPE and CENTRAL ASIA: Albania, Armenia, Austria, Azerbaijan, Bosnia and Herzegovina, Belgium, Bulgaria, Belaruss, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Kazakhstan, Latvia, Lithuania, Luxemburg, Moldova, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom (Total 40)

LATIN AMERICA and CARIBBEAN: Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Peru, St. Kitts and Nevis, Trinidad and Tobago, Uruguay (Total 20)

MIDDLE EAST and NORTH AFRICA: Baharein, Egypt, Iran, Israel, Jordan, Lebanon, Kuwait, Morocco, Malta, Tunisia (Total 10)

NORTH AMERICA: Canada, United States (Total 2)

SOUTH ASIA: Afghanistan, Bangladesh, Bhutan, India, Maldives, Sri Lanka (Total 6)

SUB-SAHARAN AFRICA: Angola, Botswana, Burkina Faso, Burundi, Cameroon, Congo, Cote d'Ivoire, Ethiopia, Ghana, Lesotho, Mali, Mauritius, Namibia, Seychelles, South Africa, Sudan, Zambia (Total 17)

Total cross section 109

Tables

Tab A.1 FE regression, dependent variable EXPENSE, robust standard errors between brackets, sample reduced to 25 years (1993-2018)					
	(21)	(22)	(23)	(24)	(25)
GDP	1.02778e-05 (1.95880e-05)	-3.13318e-05 (2.16822e-05)	-8.11754e-06 (2.44395e-05)	-3.31053e-05 (2.21808e-05)	0.000279349 (7.65801e-05)***
DEPENDENCY RATIO		-0.104100 (0.0138007)***	-0.119573 (0.0155122)***		-0.0689432 (0.0391563)*
DEPENDENCY RATIO YOUNG				6.10893e-09 (1.58502e-09)***	
DEPENDENCY RATIO OLD				-0.0897541 (0.0127324)***	
TRADE			-0.0569052 (0.00860330)***		-0.00774017 (0.0148039)
NETFDI			0.00133212 (0.0179755)		0.0456840 (0.0128141)***
GINI					-0.194140 (0.0590004)***

Tab A.2 FE regression, dependent variable EXPENSE, robust standard errors between brackets, sample composed only by OECD countries					
	(26)	(27)	(28)	(29)	(30)
GDP	3.46690e-05 (4.93556e-05)	1.30123e-05 (5.08661e-05)	1.51190e-05 (5.75333e-05)	-7.32567e-05 (5.24173e-05)	0.000206152 (0.000107609)*
DEPENDENCY RATIO		-0.154120 (0.0621419)**	-0.173438 (0.0635432)***		0.0234056 (0.126232)
DEPENDENCY RATIO YOUNG				1.19036e-07 (2.05344e-08)***	
DEPENDENCY RATIO OLD				-0.229539 (0.0557106)***	
TRADE			-0.00459573 (0.0145147)		0.0187127 (0.0224222)
NETFDI			-0.0378236 (0.0111435)***		-0.0474449 (0.0118697)***
GINI					-0.338957 (0.104403)***

Regressions

$$(1)/(21)/(26) \text{ EXPENSE}_{it} = \text{const} + \beta_1 \text{GDP}_{it} + \alpha_i + \varepsilon_{it}$$

$$(2)/(22)/(27) \text{ EXPENSE}_{it} = \text{const} + \beta_1 \text{GDP}_{it} + \beta_2 \text{DEPENDENCY RATIO}_{it} + \alpha_i + \varepsilon_{it}$$

$$(3)/(23)/(28) \text{ EXPENSE}_{it} = \text{const} + \beta_1 \text{GDP}_{it} + \beta_2 \text{DEP RATIO}_{it} + \beta_5 \text{TRADE}_{it} + \beta_6 \text{NETFDI}_{it} + \alpha_i + \varepsilon_{it}$$

$$(4)/(24)/(29) \text{ EXPENSE}_{it} = \text{const} + \beta_1 \text{GDP}_{it} + \beta_3 \text{DEP RATIO YOUNG}_{it} + \beta_4 \text{DEP RATIO OLD}_{it} + \alpha_i + \varepsilon_{it}$$

$$(5)/(25)/(30) \text{ EXPENSE}_{it} = \text{const} + \beta_1 \text{GDP}_{it} + \beta_2 \text{DEP RATIO}_{it} + \beta_5 \text{TRADE} + \beta_6 \text{NETFDI} + \beta_7 \text{GINI} + \alpha_i + \varepsilon_{it}$$

$$(6) \text{ CONSUMPTION}_{it} = \text{const} + \beta_1 \text{GDP}_{it} + \alpha_i + \varepsilon_{it}$$

$$(7) \text{ CONSUMPTION}_{it} = \text{const} + \beta_1 \text{GDP}_{it} + \beta_2 \text{DEPENDENCY RATIO}_{it} + \alpha_i + \varepsilon_{it}$$

$$(8) \text{ CONSUMPTION}_{it} = \text{const} + \beta_1 \text{GDP}_{it} + \beta_2 \text{DEPENDENCY RATIO}_{it} + \beta_5 \text{TRADE}_{it} + \beta_6 \text{NETFDI}_{it} + \alpha_i + \varepsilon_{it}$$

$$(9) \text{ CONSUMPTION}_{it} = \text{const} + \beta_1 \text{GDP}_{it} + \beta_3 \text{DEP RATIO YOUNG}_{it} + \beta_4 \text{DEP RATIO OLD}_{it} + \alpha_i + \varepsilon_{it}$$

$$(10) \text{ CONSUMPTION}_{it} = \text{const} + \beta_1 \text{GDP}_{it} + \beta_2 \text{DEP RATIO}_{it} + \beta_5 \text{TRADE}_{it} + \beta_6 \text{NETFDI}_{it} + \beta_7 \text{GINI}_{it} + \alpha_i + \varepsilon_{it}$$

$$(11) \text{ EXPENSE}_{it} = \text{const} + \beta_1 \text{GDP}_{it} + \varepsilon_{it}$$

$$(12) \text{ EXPENSE}_{it} = \text{const} + \beta_1 \text{GDP}_{it} + \beta_2 \text{DEPENDENCY RATIO}_{it} + \varepsilon_{it}$$

$$(13) \text{ EXPENSE}_{it} = \text{const} + \beta_1 \text{GDP}_{it} + \beta_2 \text{DEPENDENCY RATIO}_{it} + \beta_5 \text{TRADE}_{it} + \beta_6 \text{NETFDI}_{it} + \varepsilon_{it}$$

$$(14) \text{ EXPENSE}_{it} = \text{const} + \beta_1 \text{GDP}_{it} + \beta_3 \text{DEP RATIO YOUNG}_{it} + \beta_4 \text{DEP RATIO OLD}_{it} + \varepsilon_{it}$$

$$(15) \text{ EXPENSE}_{it} = \text{const} + \beta_1 \text{GDP}_{it} + \beta_2 \text{DEP RATIO}_{it} + \beta_5 \text{TRADE}_{it} + \beta_6 \text{NETFDI}_{it} + \beta_7 \text{GINI}_{it} + \varepsilon_{it}$$

$$(16) \text{ CONSUMPTION}_{it} = \text{const} + \beta_1 \text{GDP}_{it} + \varepsilon_{it}$$

$$(17) \text{ CONSUMPTION}_{it} = \text{const} + \beta_1 \text{GDP}_{it} + \beta_2 \text{DEPENDENCY RATIO}_{it} + \varepsilon_{it}$$

$$(18) \text{ CONSUMPTION}_{it} = \text{const} + \beta_1 \text{GDP}_{it} + \beta_2 \text{DEPENDENCY RATIO}_{it} + \beta_5 \text{TRADE}_{it} + \beta_6 \text{NETFDI}_{it} + \varepsilon_{it}$$

$$(19) \text{ CONSUMPTION}_{it} = \text{const} + \beta_1 \text{GDP}_{it} + \beta_3 \text{DEP RATIO YOUNG}_{it} + \beta_4 \text{DEP RATIO OLD}_{it} + \varepsilon_{it}$$

$$(20) \text{ CONSUMPTION}_{it} = \text{const} + \beta_1 \text{GDP}_{it} + \beta_2 \text{DEP RATIO}_{it} + \beta_5 \text{TRADE}_{it} + \beta_6 \text{NETFDI}_{it} + \beta_7 \text{GINI}_{it} + \varepsilon_{it}$$

$$(21) \text{ SUBSIDES\&TRANSFERS}_{it} = \text{const} + \beta_1 \text{TRADE}_{it} + \beta_2 \text{NETFDI}_{it} + \alpha_i + \varepsilon_{it}$$

$$(22) \text{ SUBSIDES\&TRANSFERS}_{it} = \text{const} + \beta \text{GINI}_{it} + \alpha_i + \varepsilon_{it}$$