Public-private partnerships: pro-cyclical or counter-cyclical? an empirical study

Abstract

The use of public works programs to combat economic recessions is a recurring issue. In this paper we conducted an empirical analysis covering 160 countries (out of which 43 were retained) over 30 years, to determine to what extent it has been possible in the past to deploy PPPs as part of a wider countercyclical policy. The main criterion used in the analyses performed is the comparison between numbers and values of PPP projects reaching financial close during recessions and those outside a recession. The results are disappointing: only a handful of European countries have been successful. The only sensible approach, that works only in some developed nations, would be increasing the number of PPP projects while maintaining project size. This research contributes to the understanding of PPP adoption during economic recessions, sheds light on the different strategies of developed and developing countries, and emphasizes the challenges and opportunities associated with implementing countercyclical PPP policies. These insights can inform policymakers, practitioners, and researchers in their decision-making processes and contribute to the advancement of knowledge in the field of PPP project procurement and management.

KEYWORDS: Public-Private Partnerships, PPP, counter cyclical, recession, economic crisis

Introduction

The construction of public infrastructure requires significant amounts of resources. These resources are so important that they can be expressed as a percentage of a country's GDP

(see for instance Dobbs et al., 2013). Thus, given its weight in a national economy and the potential discretion of a government to speed up or slow down the investment in infrastructure, much attention has been paid by scholars and politicians to the relationship between infrastructure policy and economic policy (Keynes, 1936). The debate about the convenience of launching major public works programs to combat economic recessions – such as the Humphrey-Hawkings Act of 1978 in the United States or the Plan Ẽ of 2008 in Spain (Bellod Reondo, 2015) - is a recurring issue.

Following this logic, public infrastructure spending could adopt a countercyclical profile, that is, it could increase during recessions to compensate for the lack of activity from the private sector. This would as well avoid competition for resources with the private sector during the expansive phase of the economic cycle, that might lead to an overheating of the economy. It is however more easily said than done. To begin with, there is a delay that might be quite important in the execution of a public works program and that may take up to several years, although this may be somewhat improved using electronic procurement (Lewis-Faupel et al., 2016). More critical still might be the effect of fiscal constraints on public spending during economic crises. In the end, public investment in infrastructure tends to be generally pro-cyclical (Välilä et al., 2005; Candelon et al., 2009). As far as potentially countercyclical public expenditure is concerned, '*austerity measures during a crisis are followed by increases in spending during the recovery, thus giving shape to a procyclical pattern in public finances*' (Ocampo, 2011, page 16).

In this context, Public-Private Partnerships (PPPs) have become a very interesting alternative to traditional infrastructure procurement. Although there is not a widely accepted definition for the term PPP (European Commission, 2004; Standard and Poor's 2005; Hemming, 2006; Hodge and Greeve, 2007; OECD, 2008), a broad view would

48 catalogue a PPP as '*A long-term contract between a private party and a government*
49 *entity, for providing a public asset or service, in which the private party bears significant*
50 *risk and management responsibility and remuneration is linked to performance*' (The
51 World Bank, 2017, page 18). Usually, the risk transfer to the private partner requires that
52 the private partner finances totally or partially the capital expenditure required by the
53 project. During the crises that plagued many Western Economies during the mid-1980s,
54 PPPs were seen as an answer to take some pressure from public budgets (Edward et al.,
55 2004; Klijn, 2009). Amongst the advantages put forward by PPP advocates, an important
56 one is precisely the appeal of private capital during fiscal consolidation periods, allowing
57 governments to execute infrastructure projects that otherwise would never materialize, or
58 would suffer an important delay (Välilä, 2005; Bensaïd and Marty, 2014).

59 However, there is theory and then there is practice. Although there has been a steady
60 increase in the number of PPP projects globally, particularly in developed regions such
61 as Europe (Välilä et al., 2005; Wagenvoort et al., 2010), it is not clear that the main driver
62 for the implementation of PPP projects is its counter-cyclical potential. The empirical
63 evidence focuses on the 2007-2008 financial crisis and seems to be contradictory. Some
64 authors claimed that the implementation of new PPP projects was greatly affected
65 (Wagenvoort et al., 2010; Bensaïd and Marty, 2014; Regan et al., 2017; European Court
66 of Auditors, 2018) while for others it was merely a slowdown (Cuttaree and Madri-
67 Perrott, 2013; Nikolic et al., 2020).

68 The objective of this paper is to empirically determine to what extent Governments have
69 been using PPPs as part of their infrastructure and economic policies during periods of
70 fiscal consolidation. The analysis spans 30 years, to cover not just the 2007-2008 financial
71 crisis but previous crises as well. Also, the geographic focus covers 160 countries to avoid

a regional bias. The main criterion used in the analyses performed is the phase of the economic cycle at which PPP projects reach financial close. We will refer to countries that manage to increase the value of PPPs executed during recessions as '*PPP countercyclical*', while countries that slow down their activity during this time will be labelled '*PPP procyclical*'.

The paper is structured in three sections. We begin by performing a literature review. We then describe the methodology and data used in this paper, which relies on the compilation of a comprehensive database and its ulterior analysis. Afterwards, we present our analysis and results. We finalize with some conclusions.

Literature Review

The study of economic cycles, their effects and how to cope with them is not a new one. The predominant theories that are currently applied by Western Governments can be traced to the 1930s, with the publication of the General Theory (Keynes, 1936). In the following years, many scholars discussed Keynes' work, further elaborating his theories (for instance Samuelson and Solow, 1960), or refuting them (Friedman, 1957; Friedman, 1960; von Hayek, 2012). It was Keynes' ideas that took the upper hand until recently. His view that recessions reflect an inadequate aggregate demand is still a central idea to modern macroeconomics.

For many decades economists explored ways to increase demand during recessions to foster economic recovery. However, public infrastructure investment was neglected by academia for several decades (Gramlich, 1994). Although timidly explored during the seventies (Mera, 1973), it wasn't until a decade later that it became a fashionable

95 academic topic (Costa and Ellson, 1987; García and McGuire, 1987; Eberts, 1988), with
96 many papers on the issue during the following decades. Not just the short-term but also
97 the mid-term and long-term effects of public infrastructure investments have been
98 thoroughly researched. There is a consensus that public infrastructure stimulates
99 economic activity, although the extent of this effect seems to depend as well on other
100 factors such as the individual location (Fox and Smith, 1990), the institutional capabilities
101 of the public sector (Esfahani and Ramírez, 2003) or the sector in which these investments
102 take place and potential over-investment (Canning and Pedroni, 2004; Egert et al., 2009).

103 It is precisely these supposedly short-term and long-term effects that motivated the
104 (re)adoption of PPPs, particularly when the United Kingdom's economy suffered an
105 important recession at the end of the eighties and beginning of the nineties. The
106 implementation of PPP programs was expanded to many other countries in the following
107 years, first in developed and later in developing countries. A very important interest of
108 academia in the topic ensued, with many papers being published. According to de Castro
109 et al. (2016), since 1990 there has been a steady momentum toward growth in the number
110 of papers, with most of the work focusing on contract design, risk-sharing, and contract
111 performance and benefits. Zhang et al. (2020) found that the number of PPP articles
112 published in 2009-2019 substantially increased comparing to 1998-2008. According to
113 Song et al. (2016), the existing studies in the sector of PPP research focus primarily on
114 Engineering, Business and Economics, and Public Administration. Zhang et al. (2020)
115 identified five major research streams of PPP in the 2009-2019 decade: promotion of PPP,
116 risk management process of PPP, financial issues, contract management, legal and
117 procurement issues, governance and performance issues and the literature research of PPP
118 in the construction industry. Ma et al. (2019) identify future research directions in PPP,
119 amongst which the most relevant ones are sustainability and innovation, BIM and

120 comparative studies of PPP practice between developed and developing countries.

121 Within the Business and Economics category, some papers have focused on PPPs and
122 economic cycles. Much of this research originated as a result of the financial crisis of
123 2007-2008 and focused on three particular issues: how do financial crises affect existing
124 PPP projects; how do financial crises affect the implementation of new PPP projects and
125 what can be done to overcome these difficulties.

126 Although all authors seem to agree that the 2007-2008 crisis harmed the implementation
127 of new PPP projects, they differ when it comes to describing the importance of this effect.

128 To some authors, the financial crisis had an important negative effect on the
129 implementation of new PPP projects. Burger et al. (2009) found the main channels of
130 transmission of the financial crisis to be the cost of and access to finance, with PPPs in
131 the pipeline phase being the most affected ones. Plumb et al. (2009) found that the 2007-
132 2008 financial crisis resulted in a lower number of private infrastructure sponsors and
133 private financial institutions willing to be involved in PPPs, which translated in turn in
134 lower competition and higher total costs. According to Wagenvoort et al. (2010), PPP
135 project finance fell substantially during the 2007-2008 financial crisis, reversing the
136 previous trend of more private and less public financing of public infrastructure. Bensaïd
137 and Marty (2014, page 6) state that the important development of PPPs that took place in
138 the UK and continental Europe between 2000 and 2008 '*was seriously undermined by the*
139 *crisis that started in 2007*', with a clear trend towards fewer but much bigger PPP
140 projects, and demand risk being retained by the public sector. Regan et al. (2017) reported
141 on the difficulties experienced in Australia to obtain project finance for PPPs in the
142 aftermath of the 2007-2008 crisis. Beyond financing difficulties, an investigation carried
143 out by the European Court of Auditors (2018) covering 12 European Union (EU) co-

financed PPPs in France, Greece, Ireland and Spain in the sectors of *Road Transport* and *Information and Communications Technology* (ICT) found that '*procuring PPPs typically requires negotiating on aspects that are usually not part of traditional procurement and therefore takes up more time than traditional projects*'. This could potentially reduce dramatically the implementation of PPPs as a countercyclical policy, or at least as a substitute for ordinary procurement during times of austerity.

To other authors, the effects of the financial crisis were not as important. According to Cuttaree and Madri-Perrott (2013), PPPs held up reasonably well during the crisis, although private investors became more discriminating – seeking particularly to decrease their risk. This would be in line with the findings of Nikolic et al. (2020), that after studying awarded PPP contracts on the road sector over 20 years in the European Union and Latin America and the Caribbean concluded that market slow downs during crises are brief and are followed by a re-bounce and an upward trend.

Finally, some research has been done regarding measures that could help to overcome difficulties in the implementation of PPP projects during crises. To revitalize PPP activity in the European Union, several mechanisms were put in place to combine private funds with EU funds (EPEC, 2011) – decreasing in practice the amount of financing brought by the private sector. However, Cuttaree and Madri-Perrott (2013) suggested that PPPs are considered as '*off-balance sheet structures*', and modifying PPP design to make them more attractive to the private sector (for instance by providing public guarantees of private loans) would probably greatly reduce the incentives that governments currently have to implement PPP projects.

To the best of our knowledge, there are currently no comprehensive empirical studies – in terms of time-length, regions or PPP sectors - on the implementation of PPPs during

168 economic crises.

169 **Materials and methods**

170 To carry out this investigation, a comprehensive PPP project database has been
171 assembled. The information required for each project is at least its sector, its capital
172 expenditure, its location, the financial close date and whether the economy was in a
173 recession when the financial close was achieved.

174 There isn't a single reliable database containing all the necessary information previously
175 mentioned with a broad regional focus. Thus, several databases were used to collect the
176 necessary data, being the main criteria for their inclusion in this study their reliability and
177 comprehensiveness. The reliability and comprehensiveness were assessed through the
178 reputation of the institutions that collected and assembled the information. To facilitate
179 the combination of the datasets, databases with no overlapping geographic focus or
180 country profile were preferred.

181 The databases finally selected were: The World Bank's Private Participation in
182 Infrastructure (World Bank, 2019) – WB PPP Database - to collect information on PPP
183 projects located in low-income, lower-middle-income and upper-middle-income
184 countries, that is, countries with a gross national income (GNI) per capita lower than
185 13,205 USD (the criteria used by the database); The European PPP Expertise Center's
186 Data (EPEC, 2019) – EPEC PPP Database - to collect PPP information on PPP projects
187 located in European countries (the criteria used by the database); And finally a proprietary
188 database (Public Works Financing, 2013) – PWF Database - for PPP projects located in
189 countries that were not included in the two previous datasets.

190 One of the constraints in our research pertains to the absence of an ideal, comprehensive

191 database containing all the required information for our study. We recognize this
192 difficulty and have endeavoured to overcome it by employing three reputable databases.
193 Our intention in merging these three databases was to acquire the most comprehensive
194 and reliable information possible, thus facilitating the effective conduct of our research.
195 Nevertheless, it is crucial to acknowledge that despite our best efforts, certain limitations
196 may persist owing to the intrinsic characteristics of the data sources..

197 Table 1 has a summary of the main characteristics of the three databases used in the paper:

198 **Table 1. Main characteristics of the PPP projects databases used.**

199 [TABLE 1 AROUND HERE]

200 The information from these databases was collected in Excel spreadsheets, that were
201 directly downloaded from the internet (WB PPP Database) or provided by the database's
202 owners when the information was not public (EPEC PPP Database and PWF Database).

203 Combining the databases, however, was problematic. Problems were encountered in
204 terms of country overlapping and homogenization of information across databases.

205 Although the selection of the databases was meant to avoid geographic overlap, the EPEC
206 PPP Database and the PWF Database overlapped in projects located in European
207 countries. The combined database used in the study was used as a starting point the EPEC
208 PPP Database. A verification of European countries in the PWF Database was then
209 carried out, to identify additional projects that may have been missing in the EPEC PPP
210 Database. Finally, non-European developed countries in the PWF Database were
211 included. This way, a more comprehensive dataset of PPP projects was obtained, without
212 repetitions.

The heterogeneity of the information captured for each project across the three databases was also problematic. To successfully merge them, the following steps were followed:

- Performing a '*sector*' check for the three databases to determine what information about PPP projects was systematically collected, independently of the database source.

- Verifying the definition of these '*sectors*' across databases, to make sure that for similar '*sectors*' the information captured was homogeneous.

Finally, a merged dataset was created using only information in '*sectors*' that were common to the three databases, after this information had been homogenised in terms of fields and currency.

In terms of project value, more than 50% of all the PPP projects have a capital expenditure below 90 million USD, and 9% of the projects are above 600 million USD. This distribution is still the same for both the WB and the EPEC Databases. The PWF Database also adopts this pattern, although with fewer 'small projects' and more 'mega-projects'. In summary, all the datasets have '*long tails*'.

[FIGURE 1 AROUND HERE]

Figure 1. Distribution of the number of projects included in the Databases according to project size.

Nevertheless, there are many countries with a very limited number of PPPs. For instance, there are 107 countries with five or fewer PPP projects. It is very unlikely that countries with very limited experience in PPPs can use them as part of the countercyclical policy. For a certain country to qualify as part of this study, it must have developed a minimum number of PPP projects. The problem is that the higher this minimum number of PPP projects is, the lower the number of countries that are qualified.

[FIGURE 2 AROUND HERE]

Figure 2. Distribution of countries according to the number of PPP projects developed.

In the end, it was decided that only countries with more than 25 PPP projects were to be considered in this study. This limit strikes a nice balance between ensuring that only countries with relevant PPP experience -and thus the potential to develop PPP projects throughout the entire economic cycle- are included in the analyses, while still having a large enough sample of countries. Introducing this limitation reduces the sample to 43 countries (27% of the total), accounting for 9,513 projects (93% of the total) and an accumulated investment of 2.23 Trillion USD (91% of the total). For these selected countries, there is a clear relationship between the number of PPP projects developed and the capital expenditure invested – pointing in fact towards a quite similar average project size.

[FIGURE 3 AROUND HERE]

Figure 3. Number of PPP projects and total value of PPP projects in countries with more than 25 PPP projects.

The transport and energy sectors are the predominant ones in value, as per the following figure.

[FIGURE 4 AROUND HERE]

Figure 4. Value distribution by sector of the PPP projects in the 43 countries included in the study.

To determine when an economic crisis takes place in a country, the main indicator used has been quarterly GDP growth. The sources for GDP data have been Eurostat (2020), which has quarterly GDP data for the majority of EU countries since approximately 1995, and the IMF (2020), which has yearly GDP for the vast majority of the countries in the world from 1980 up to 2010, and quarterly data from 2011 onwards. It must be pointed

out that sometimes there is no GDP information available for certain countries at certain periods of time, something that is more likely to happen in developing countries.

The classical definition adopted in many countries of a technical recession, as two or more consecutive quarters of contraction in national GDP, is too restrictive and provides a false picture of reality. Thus, a period of recession in this paper is characterized by either two or more consecutive quarters of contraction in GDP, or an annual contraction in national GDP for those years in which there was no quarterly GDP information available.

Table 2. Total amount of growth and recession periods for all the countries in the PPP database.

[TABLE 2 AROUND HERE]

The above definition is still too restrictive since there are recessions that do not show as such with the available data (for instance the 1991 Indian economic crisis, or the Mexican peso crisis of 1995). Thus, a list of well-known recessions has been elaborated (as shown in Annex 1), and those periods have been characterized as recessions as well. This adjustment increases slightly, for the 43 countries considered, the period of recession.

Table 3. Total amount of growth and recession periods for the 43 countries considered in the study.

[TABLE 3 AROUND HERE]

It is noteworthy that the recession periods are low in the timespan analysed, which could be a limitation to this study.

The ratios '*projects/year*' and '*value/year*' are used to determine if the investment through PPPs during recessions is higher or lower than the average. The number of years

285 in the analyses is equal to the sum of the years analysed for each of the 43 countries that
286 integrate the study, which adds up to 1.189 years (28 years per country on average).
287 Likewise, a total number of "growth years" and "recession years" can be obtained, by
288 adding the number of years and quarters in which individual countries' economies are
289 expanding or shrinking. The growth years obtained is 1,094, and the number of recession
290 years is 95.

291 **Results and discussion**

292 This section describes the analyses carried out on the PPP project database for the 43
293 countries selected. The goal is to identify clear patterns regarding the procyclical or
294 countercyclical nature of PPP investment in these countries.

295 The analysis relies on the database that was put together in Excel through the combination
296 of three different databases (as previously described), and the tools offered in Excel for
297 data analysis – such as pivot tables and filters. These tools allow the combination of
298 projects that meet certain characteristics, such as reaching financial close at a certain
299 period, belonging to countries with a specific profile, etc. The tools allow for the
300 establishment of several criteria simultaneously. The analysis goes from the general and
301 consolidated (all countries) to the particular (individual countries).

302 Many PPP projects in the database, 10% of the total (945), managed to reach financial
303 close during an economic crisis. It could seem that this number is quite small, but if we
304 add context and consider the time that the economy has been in a recession, we find that
305 the activity on the PPP sector increases during recessions, in the number of projects and
306 in their total value.

307 **Table 4. Aggregated number and value of PPP projects that reached financial**

close during the growth and recession phases of the economic cycle (1990-2020).

[TABLE 4 AROUND HERE]

The discussion of the results will address the private sector's risk appetite, that according to Burger et al. (2009) decreased during the 2008 financial crisis.

Project size analysis

Although PPP projects that reached financial close during a crisis are on average smaller than those that were implemented during the expansive phase of the cycle, this difference (as shown in Table 4) is quite small: 213 Million USD versus 240 Million USD, or an 11% difference.

Also, when looking at the size distribution of PPP projects, there is little difference in what happens during a recession. At these times the size of PPP projects seems to move a little bit away from the extremes as compared to what happens during the growth phase of the economic cycle.

[FIGURE 5 AROUND HERE]

Figure 5. Distribution of PPP projects according to project value.

More data would be needed to assess these results from a risk reduction perspective. For instance, to decrease risk exposure through diversification private investors would be motivated to reduce their total investment and to spread it over a larger pool of projects. This could potentially translate into smaller PPP projects – or projects with a larger number of sponsors.

Sector analysis

This section performs an analysis of PPP projects during the economic cycle considering the type of infrastructure or sector. It is noteworthy that, as shown in figure 4, the *Transport* and *Energy* sectors account for 67% of the total number of projects and 80% of the total project value.

The data suggest that, during recessions, there is a slight drop in the number of transport and energy projects, which is more than compensated by a very important increase in all the other categories, in particular in PPP buildings.

Table 5. Number of PPP projects that reach financial close depending on the phase of the economic cycle, for 43 selected countries.

[TABLE 5 AROUND HERE]

When considering project value, the drop in PPP investment during recessions is only observed in two categories: Energy and Information and communication technology. This is compensated by the increase in other sectors.

Table 6. Value of PPP projects that reach financial close depending on the phase of the economic cycle, for 43 selected countries.

[TABLE 6 AROUND HERE]

This means that, as far as project size is concerned, the average size of PPP transport projects would increase during recessions – as well as the size of PPP Municipal Solid Waste projects and, to a lesser extent, PPP Water and sewerage projects.

Table 7. Average PPP project size of projects that reach financial close depending on the phase of the economic cycle, for 43 selected countries.

[TABLE 7 AROUND HERE]

The *Transport* sector is made of four main sub-categories: *Roads* (55% of total value), *Ports* (18% of total value), *Railways* (11% of total value) and *Airports* (8% of total value). The number of *Road* and *Railway* PPP projects decrease during recessions, but the projects are bigger, resulting in the end in bigger investments during those periods. PPP *Airports* and *Ports,* on the other hand, suffer a significant reduction in the total investments carried out during recessions.

Table 8. Value of PPP Transport projects that reach financial close depending on the phase of the economic cycle, for 43 selected countries.

[TABLE 8 AROUND HERE]

Within the *Energy* sector, there is, unfortunately, a large proportion of projects (52% in value) that have not been categorized. According to the data gathered, it would seem that during recessions the total investment in this sector falls across all sub-categories, except *Wind*, *Gas* and *Hydro* projects.

Table 9. Value of PPP Energy projects that reach financial close depending on the phase of the economic cycle, for 43 selected countries.

[TABLE 9 AROUND HERE]

An important difference across different types of PPP would be the possibility of transferring demand risk to the private sector, one of the most important risks associated to infrastructure projects. Transport and energy projects can transfer demand risk to the private sector, while it is difficult to do so with PPP buildings. Arguably, and all other things being equal, the overall risk for a PPP building project is lower than the overall

risk of a PPP transport or an energy project. However, only a drop in value in the energy sector during recessions is observed – which may be explained by the fact that energy consumption and its forecasts seem gloomier at these times.

Developing vs developed countries

The characteristics of recessions are nevertheless different in developing and in developed economies. Could this possibly show in the number of PPP projects that reach financial close during an economic crisis? To carry out the analysis, OECD countries have been used as a proxy to the level of economical development.

The data shows that in developed countries, the number of projects that managed to reach financial close during an economic crisis (5.6 projects/year) more than doubles what happens during the growth phase of the cycle (2.3 projects/year). This fact is somewhat attenuated when the analysis focuses on value per year during recession and growth periods. The conclusion is that during recessions the investment in PPPs in OECD countries increases, at the expense of average project size.

Table 10. Number and value of PPP projects during the phases of the economic cycle in OECD countries.

[TABLE 10 AROUND HERE]

In non-OECD countries, however, the number of PPPs and the investment in PPPs decrease during recessions, and so does the average size of PPP projects.

Table 11. Number and value of PPP projects during the phases of the economic cycle in Non-OECD countries.

[TABLE 11 AROUND HERE]

Regarding the distribution of PPP projects according to the project size, it stands out how in developed economies mega-projects are proportionally more common than in developing countries. Inversely, micro-projects are more frequent in developing countries.

The distribution of project size does not seem to be greatly affected by the development of the economy and the phase of the cycle, other than by the slight decrease in mega-projects and the increase in micro-projects. This happens however in developing and developed countries.

[FIGURE 6 AROUND HERE]

Figure 6. Distribution of PPP projects according to project value – developed vs developing countries.

The overall risk associated to infrastructure projects is higher in developing countries than in developed countries. The results of the analysis performed would be in line with the conclusions reached by Burger et al. (2009) after the 2008 financial crisis, and the private sector's risk appetite reduction that followed. According to Ettinger et al. (2005), one of the reasons behind the drop in private infrastructure after the 1997/98 peak was precisely the financial crisis that made investment in developing countries riskier.

Country analysis

In this section we carry out an analysis country by country to identify outliers, that is, countries that have a high rate of projects reaching financial close during recessions.

Out of the 43 countries included in the study, there are ten countries in which, according

to the data available, there have been no technical recessions (two or more consecutive quarters of contraction in GDP). Thus, it is not possible to know if these countries would in practice be capable of implementing PPPs during an economic crisis. This leaves 33 countries in the sample, balanced in terms of developing and developed countries, and still accounting for a very large portion of the PPPs in the database, both in number and value.

Table 5. Main characteristics of the dataset used in the individual country analysis.

[TABLE 12 AROUND HERE]

Out of this sample, five countries did not have PPP projects reaching financial close during recessions. All these countries (except for Chile) didn't belong to the OECD.

For the remaining 28 countries, nine have succeeded in increasing the value of PPP projects reaching financial close during recessions, while 19 seem to slow down their PPP programs at these times.

The experience of a particular country with PPPs, independently of whether it is measured as the time elapsed since the financial close of the oldest PPP in the database or as the number of PPPs that have reached financial close, doesn't seem to have a significant influence on that country being *PPP countercyclical* or *PPP procyclical*.

[FIGURE 7 AROUND HERE]

Figure 7. Number of PPP projects and years of experience with PPPs.

The economic development of a country however would play an important role in its capacity to adopt a PPP countercyclical profile. Out of the nine *PPP countercyclical* countries identified, eight belong to the OECD – only non-OECD Romania manages to join this category. It is also noteworthy that these countries are in Europe (or its vicinity).

[FIGURE 8 AROUND HERE]

Figure 8. PPP Countercyclical countries (except Turkey).

It is also interesting to study how, for a particular country, the number and average size of PPP projects evolve during recessions. In an ideal world, to adopt a PPP countercyclical profile it would be advisable to increase simultaneously the number and the size of PPP projects that reach financial close during recessions. If it is not possible to increase these two variables at the same time, the question would be whether it works better to sacrifice the number of PPP projects or the size of PPP projects. The evidence strongly points towards an increase in project number as the more effective way to achieve this increased value during recessions.

[FIGURE 9 AROUND HERE]

Figure 9. Changes in the number of PPP projects and average PPP project size that reach financial close during recessions.

A clear pattern begins to emerge: *PPP countercyclical* countries tend to increase the number of PPP projects during recessions, while not sacrificing too much the average project size. It is noteworthy that three countries (Australia, Ireland and Malaysia) do not succeed to increase PPP value during recessions even when following this strategy.

Many *PPP procyclical* countries on the other hand would experience a simultaneous drop in the number of projects and the average project size.

[FIGURE 10 AROUND HERE]

Figure 10. Country classification according to the strategy followed to achieve excess PPP value growth during recessions.

A closer look at 'PPP countercyclical' countries

The profile of the nine *PPP countercyclical* countries identified in this study can be found in the following table.

Table 6. Profile of PPP countercyclical countries.

[TABLE 13 AROUND HERE]

It is noteworthy that these countries in general do not seem to use direct infrastructure investment as a countercyclical economic policy, registering important decreases in infrastructure spending during economic recessions (OECD, 2020). This seems to endorse the thesis that a well-planned PPP program can be the key instrument to develop efficient contra cyclical infrastructure policies.

In these countries, PPP projects can be broken into five or more sectors, with one or two that are predominant and that account for at least 60% of the total PPP capital expenditure. In general *PPP countercyclical* countries focus during recessions on these main sectors, ensuring that the number of projects increases while the average project size grows, stays the same or suffers a small reduction.

In the UK, the *Buildings* and *Transport* sectors account for 82% of PPPs in value. A detailed analysis shows that the number of projects in both sectors during recessions increases significantly, while the average value of *Transport* projects doesn't change, and that of PPP *Buildings* projects suffers a slight decrease (-13.5%). Historically, PPPs in the UK have been characterized by the retention of demand risk by the public sector, which may have been an important factor in helping to maintain and increase the volume of PPP projects during recessions.

In Romania, the *Energy* sectors accounts for 82% of PPPs in value. During past recessions, the country cancelled almost all other types of PPPs, but still managed to increase the number and the average size of *Energy* projects. This is somewhat of a unique case, since energy projects usually suffer during recessions, as previously shown.

In Portugal, the Transport sector accounts for 93% of PPPs in value. During past recessions, the country has managed to increase slightly the number of PPP *Transport* projects, although the average size of these projects has remained the same. More information would be needed to determine changes in the risk transfer to the private sector (for instance, regarding demand risk) during recessions, that could explain this behaviour.

A similar pattern emerges for the other *PPP countercyclical* countries, that significantly increased the number of projects while maintaining or slightly reducing the average project size (the Netherlands, Germany, France, Belgium, Bulgaria and Turkey). More information would be needed regarding the composition of the projects' shareholders, in order to assess a risk reduction through diversification.

None of the *PPP countercyclical* countries reduced the number of projects during recessions on their main PPP sectors.

A closer look at 'PPP procyclical' countries

These countries also share with *PPP countercyclical* countries the feature of developing PPP projects in five or more sectors, with one or two very predominant ones.

However, many of these sectors seem to be deeply affected by recessions, with a simultaneous drop in the number and the average size of PPP projects. This is the case of the PPP *Transport* sector in the United States or the PPP *Energy* sector in Mexico and the Russian Federation.

Even when the number of projects in these sectors has increased during a recession, it is at the expense of the average project size, that suffers significant drops. This is the case for instance of the PPP *Transport* sector in China, Mexico and the Russian Federation. This would be compatible with a risk reduction strategy in the part of the private sector,

through diversification and reduced capital.

Finally, countries that reduce the number of projects while simultaneously trying to increase the average project size do not seem to fare much better in the end, in terms of total value achieved. This is the case for instance of the PPP *Transport* sector in Brazil.

Conclusions

Many countries around the world have incorporated PPPs into their project procurement and management toolbox. One of the main drivers for PPP adoption, as outlined by economic theory, would be for Governments to invest in public infrastructure during periods of fiscal consolidation.

At an aggregate global level, PPP activity increases slightly during economic recessions, while project size decreases slightly. From this perspective, PPPs would not be pro-cyclical or anti-cyclical. This result however may be misleading, as some countries manage to increase the volume of new PPPs during recessions, while others experience significant drops. This probably explains the controversy between authors that have previously researched the topic.

A distinction between developed and developing countries shows that during recessions the investment in PPPs in OECD countries increases, at the expense of average project size. In developing countries, however, the number and size of PPPs decrease during recessions. Again, the aggregate results may be hiding what happens at a country level.

At a country level, we can conclude the following:

- The experience of a country with PPPs, measured as the number of years since it implemented its first PPP, does not have a significant impact on the country's capability of implementing PPPs during recessions.
- Only some European developed countries (identified as OECD members in our

study) have successfully increased the volume of new PPPs during recessions. These countries seem to be capable of increasing the number of PPP projects that reach financial close on their main sectors of PPP activity, while simultaneously maintaining or slightly decreasing the average project size.

- Developing countries have not been able to use PPPs as part of their anti-cyclical policy, and PPPs adopt a pro-cyclical role in their economies.
- Countries that adopt a *PPP procyclical* profile seem to experience in general important drops in the number of PPP projects that reach financial close during recessions – often accompanied by a simultaneous drop in the average project size. Even when there is growth in the average project size, it does not make up for the decrease in the number of projects.

In the end, only a handful of countries with a very specific profile (developed economies from Europe) have managed to implement counter-cyclical PPP policies. Most countries have failed to do so. Going forward, it wouldn't seem realistic for most countries to rely on PPPs as part of a wider counter-cyclical policy. The main driver for PPP adoption should be a different one, such as the pursuit of efficiency through the creation of value for money, placing the focus on the policy's long-term effects.

Implementing PPPs during periods of fiscal consolidation seems hard, and probably requires some elements that were not part of the analysis carried out in this paper but that are only present, at least currently, in some developed countries.

It can be concluded however that a strategy based on increasing the average project size during economic crises, at the expense of the number of PPP projects, does not seem to be easy to implement. The only sensible approach to increase the value of PPP projects during recessions would be increasing the number of PPP projects while maintaining project size. Increasing simultaneously the number and size of PPP projects does not seem

a possibility in practice, as no country has managed to do so.

One of the limitations in our research is the unavailability of a single perfect database that encompasses all the necessary information for our study. We acknowledge this challenge and have made efforts to address it by utilizing three reputable databases in the industry. By combining these three databases, we aimed to gather the most extensive and reputable information available to conduct our research effectively. However, it is important to note that despite our efforts, there may still be some limitations due to the inherent nature of the data sources, such as the difficulties in determining if the differences between procyclical and countercyclical countries are statistically significant.

This research contributes to the understanding of PPP adoption during economic recessions, sheds light on the differing strategies of developed and developing countries, and emphasizes the challenges and opportunities associated with implementing countercyclical PPP policies. These insights can inform policymakers, practitioners, and researchers in their decision-making processes and contribute to the advancement of knowledge in the field of PPP project procurement and management.

Further research could identify other factors that have changed on PPP projects during recessions in *PPP countercyclical* countries, such as risk distribution or economic return to the private investors. It would be also interesting to investigate why most of the *PPP countercyclical* countries are located in Europe. Also, the topic of whether countries that have succeeded in implementing PPP countercyclical policies have fared better during recessions is worth researching.

Acknowledgments

Nothing to declare.

584 **Declaration of interest statement**

585 Nothing to declare.

586

587 **References**

588 Burger, P.; Tyson, J.; Karpowicz, I. and Delgado Coelho, M. (2009). The Effects of the
589 Financial Crisis on Public-Private Partnerships, IMF Working Paper WP/09/144, Fiscal
590 Affairs Department, International Monetary Fund, Washington.Burger, P.; Coelho, M.
591 D.; Karpowicz, I. and Tyson, J. (2009). The effects of the financial crisis on public-
592 private partnerships (Vol. 2144). Washington, DC: International Monetary Fund.
593 Bellod Redondo, J.F. (2015). Plan E: La estrategia keynesiana frente a la crisis en
594 España, Revista de Economía Crítica, Vol. 20, pp. 4-22.
595 Bensaïd, J. and Marty, F. (2014). What Makes Public-Private Partnerships Work? An
596 Economic Analysis, Cournot Centre, Paris.
597 Candelon, B.; Muysken, J. and Vermeulen, R. (2009). Fiscal policy and monetary
598 integration in Europe: an update, Oxford Economic Papers, Vol. 62(2), pp. 323-349,
599 https://doi.org/10.1093/oep/gpp017.
600 Canning, D. and Pedroni, P. (2004). The effect of infrastructure on long run economic
601 growth. *Harvard University*, Vol. 99(9), pp. 1-30.
602 Costa, J. D. S., Ellson, R. W., & Martin, R. C. (1987). Public capital, regional output,
603 and development: some empirical evidence. *Journal of regional science*, Vol. 27(3), pp.
604 419-437.
605 Cuttaree, V. and Madri-Perrott, C. (2013). Public-Private Partnerships in Europe and
606 Central Asia. Designing Crisis-Resilient Strategies and Bankable Projects, The World
607 Bank, Washington.

608 de Castro e Silva Neto, D., Cruz, C. O., Rodrigues, F., & Silva, P. (2016). Bibliometric
609 analysis of PPP and PFI literature: Overview of 25 years of research. *Journal of*
610 *Construction Engineering and Management*, Vol. 142(10), DOI:
611 10.1061/(ASCE)CO.1943-7862.0001163.
612 Dobbs, R.; Pohl, H.; Lin, D.; Mischke, J.; Garemo, N.; Hexter, J.; Matzinger, S.; Palter,
613 R. and Nanavatty, R. (2013). Infrastructure productivity: How to save $1 trillion a year,
614 The McKinsey Global Institute, London, UK.
615 Edwards, P.; Shaoul, J.; Stafford, A. and Arblaster, L. (2004). 2004. Evaluating the
616 Operation of PFI in Roads and Hospitals, Certified Accountants Education Trust,
617 London, UK.
618 Egert, B.; Kozluk, T.J. and Sutherland, D. (2009). Infrastructure and Growth: Empirical
619 Evidence. OECD Economics Department Working Paper No. 685,
620 http://dx.doi.org/10.2139/ssrn.1360784
621 EPEC (2009). The financial crisis and the PPP market. Potential Remedial Actions,
622 European Investment Bank, Luxembourg.
623 EPEC (2011). Using EU Funds in PPPs. Explaining the how and starting the discussion
624 on the future, European Investment Bank, Luxembourg.
625 EPEC (2020). EPEC Data Portal. https://data.eib.org/epec (facilitated by EPEC in
626 February 2020).
627 Esfahani, H. S. and Ramírez, M. T. (2003). Institutions, infrastructure, and economic
628 growth. *Journal of development Economics*, Vol. 70(2), pp. 443-477.
629 Ettinger, S; Schur, M.; von Klaudy, S.; Dellacha, G. and Hahn, S. (2005) Developing
630 Country Investors and Operators in Infrastructure, *Trends and Policy Options*,No. 3,
631 May (Washington: Public-Private Infrastructure Advisory Facility)
632 European Commission (2004). Green Paper on Public-Private Partnerships and

633 Community Law on Public Contracts and Concessions, COM (2004) 327, European
634 Commission, Brussels.
635 European Court of Auditors (2018). Public Private Partnerships in the EU: Widespread
636 shortcomings and limited benefits, European Union Publications, Luxembourg.
637 Eberts, R. (1986). Estimating the contribution of public capital stock to metropolitan
638 manufacturing production. Federal Reserve Bank of Cleveland Working Paper, (8610).
639 Friedman, M. (1957). Theory of the consumption function. Princeton University Press.
640 Princeton, USA.
641 Friedman, M. (1960). A Program for Monetary Stability. Fordham University Press.
642 New York, USA.
643 Fox, W. F. and Smith, T. R. (1990). Public infrastructure policy and economic
644 development. *Economic Review*, vol. 75, 49-59.
645 Garcia-Mila, T., & McGuire, T. J. (1992). The contribution of publicly provided inputs
646 to states' economies, *Regional science and urban economics*, Vol. 22(2), pp. 229-241.
647 Gramlich, E.M. (1994). Infrastructure Investment: A Review Essay. Journal of
648 Economic Literature, Vol. 32(3), pp. 1176-1196.
649 Hemming, R. (2006). Public-Private Partnerships, Government Guarantees, and Fiscal
650 Risk, Special Issues Paper, Fiscal Affairs Department, International Monetary Fund,
651 Washington.
652 Eurostat (2020). Quarterly National Accounts.
653 https://ec.europa.eu/eurostat/databrowser/view/namq_10_gdp/default/table?lang=en.
654 (Accessed September 2020).
655 Hodge, G.A. and Greve, C. (2007). Public-Private Partnerships: An International
656 Performance Review, Public Administration Review, Vol. 67(3), pp. 545-558.
657 IMF (2020): International Monetary Fund Data.

https://data.imf.org/regular.aspx?key=62771448. (Accessed September 2020).

Keynes, J.M. (1936). The General Theory of Employment, Interest and Money, New York: Harcourt, Brace and Co.

Klijn, E.H. (2009). Public-private partnerships in the Netherlands: Policy, projects and lessons. Economic Affairs, 29(1), 26–32.

Lewis-Faupel, S.; Neggers, Y.; Olken, B.A. and Pande, R. (2016). Can Electronic Procurement Improve Infrastructure Provision? Evidence from Public Works in India and Indonesia, American Economic Journal: Economic Policy, Vol. 8(3), pp. 258-283.

Ma, L.; Li, J.; Jin, R. and Ke, Y. (2019). A Holistic Review of Public-Private Partnership Literature Published between 2008 and 2018, *Advances in Civil Engineering*, vol. 2019, Article ID 7094653, 18 pages, 2019. https://doi.org/10.1155/2019/7094653

Mera, K. (1973). Regional Production Functions and Social Overhead Capital: An Analysis of the Japanese Case, *Regional and Urban Economics*, Vol. 3(2), p. 157-185.

Nikolic, A.; Roumboutsos, A.; Stankovic, J.C. and Mladenovic, G. (2020). Has the latest global financial crisis changed the way road public-private partnerships are funded? A comparison of Europe and Latin America, Utilities Policy, Vol 64, https://doi.org/10.1016/j.jup.2020.101044.

Ocampo, J.A. (2011). Macroeconomy for development: countercyclical policies and production sector transformation, CEPAL Review, Vol. 104, pp. 7-35.

OECD (2008). Public-Private Partnerships: In Pursuit of Risk Sharing and Value for Money, Organisation for Economic Co-operation and Development Publishing, Paris.

OECD (2020). Infrastructure investment. https://data.oecd.org/transport/infrastructure-investment.htm. (Accessed September 2020).

Plumb, I.; Zamfir, A. and Mina, L. (2009). Public-Private Partnerships - Solution Or

683 Victim Of The Current Economic Crisis? Annals of Faculty of Economics, University
684 of Oradea, Faculty of Economics, Vol. 4(1), pp. 426-430.
685 Public Works Financing (2013). Major Projects Database.
686 https://pwfinance.net/projects-database/ (Accessed November 2013).
687 Regan, M.; Smith, J. and Love, P.E.D. (2017). Financing of public private partnerships:
688 Transactional evidence from Australian toll roads, Case Studies on Transport Policy,
689 Vol. 5, pp. 267-278.
690 Samuelson, P. A. and R. M. Solow (1960). Analytical aspects of anti-inflation policy.
691 *American Economic Review*, Vol. 50 (2), pp. 177-194.
692 Song, J., Zhang, H., & Dong, W. (2016). A review of emerging trends in global PPP
693 research: analysis and visualization. *Scientometrics*, Vol. 107(3), pp. 1111-1147.
694 Standard and Poor's (2005). Public Private Partnerships: Global Credit Survey 2005,
695 Standard and Poor's, New York.
696 The World Bank (2017). Public-Private Partnerships Reference Guide Version 3,
697 International Bank for Reconstruction and Development / The World Bank, Washington
698 DC, USA.
699 Välilä, T. (2005). How expensive are cost savings? On the economics of public-private
700 partnerships, EIB Papers, Vol. 10(1), pp. 95-119.
701 Välilä, T.; Kozluk, T. and Mehrotra, A. (2005). Roads on a downhill? Trends in EU
702 infrastructure investment, EIB Papers, Vol. 10(1), pp. 18-38.
703 von Hayek, F. (2012). Contra Keynes and Cambridge. University of Chicago Press.
704 Wagenvoort, R.; de Nicola, C. and Kappeler, A. (2010). Infrastructure finance in
705 Europe: Composition, evolution and crisis impact, EIB Papers, Vol. 15(1), pp. 16-39.
706 World Bank (2019). Private Participation in Infrastructure Database.
707 http://ppi.worldbank.org/customquery. (Accessed September 2020).

Zhang, Y. C.; Luo, W. Z.; Shan, M.; Pan, D. W. and Mu, W. J. (2020). Systematic analysis of PPP research in construction journals: from 2009 to 2019, *Engineering, construction and architectural management*, Vol. 27(10), pp. 3309-3339.

712 **Annex 1 - List of well-known recessions**

713

Name	Countries affected	Period
Early 1990s recession	Canada	April 1990 - April 1992
	UK	3Q 1990 - 26/4/1993
	United States	1/6/1990 - 1/3/1991
	Australia	September 1990 - September 1991
	New Zealand	1990-1991
1991 Indian economic crisis	India	1991
Mexican peso crisis	Mexico	Dec 1994 - 1995
1997 Asian financial crisis	South Korea	mid 1997- mid 1998
	Thailand	mid 1997- mid 1998
	Philippines	mid 1997- mid 1998
	Malaysia	mid 1997- mid 1998
	Singapore	mid 1997- mid 1998
	Indonesia	mid 1997- mid 1998
	China	mid 1998- mid 1999
	Hong Kong	mid 1997- mid 1998
	United States	4Q 1997
	Japan	1997-1998
1998 Russian financial crisis	Russian Federation	August 1998 - 15 nov. 1998
1998–99 Ecuador financial crisis	Ecuador	1998-2000
1998–2002 Argentine great depression	Argentina	3Q 1998- 2Q 2002
Samba effect	Brazil	1999
Early 2000s recession	United States	3Q 2000 - 1Q 2003
	France and Germany	4Q 2001 - 2Q 2002
2001 Turkish economic crisis	Turkey	4Q 2000- 4Q 2001
2007-2009 Financial Crisis	World	
2008-2016 Spanish financial crisis	Spain	2008-2016
2010-2014 Portuguese financial crisis	Portugal	2010-2016
Ukrainian Crisis	Ukraine	2013-2014
Russian financial crisis (2014–2017)	Russian Federation	3Q 2014 - 4Q 2017
2014 Brazilian economic crisis	Brazil	3Q 2014 - 4Q 2016
2015–2016 Chinese stock market turbulence	China	12 June 2015 - February 2016

Turkish currency and debt crisis, 2018	Turkey	2018

714

715

716

Tables

Table 7. Main characteristics of the PPP projects databases used.

	From	Until	Countries	Country profile	Number of projects
WB PPP Database	1995	2019	124	Developing	8,302
EPEC PPP Database	1990	2019	28	European	1,858
PWF Database	1984	2013	147	World	1,554

720 **Table 8. Total amount of growth and recession periods for all the countries in the**
721 **PPP database.**

	Number of quarters	% of Total
No Data	3,804	22.4%
Growth	11,994	70.7%
Recession	1,160	6.8%
Total	16,958	100%

722

723 **Table 9. Total amount of growth and recession periods for the 43 countries**
724 **considered in the study.**

	Number of quarters	% of Total
No Data	489	9.3%
Growth	4,377	83.4%
Recession	380	7.2%
Total	5,246	100.0%

725

Table 10. Aggregated number and value of PPP projects that reached financial close during the growth and recession phases of the economic cycle (1990-2020).

	Number	Projects/year	Value (M USD)	Value (M USD) / year	Value (M USD) / project
Growth	8,568	7.8	2,056,877	1,880	240
Recession	945	9.9	200,832	2,114	213
Total	9,513	8.0	2,257,709	1,898	237

729 **Table 5. Number of PPP projects that reach financial close depending on the phase**
730 **of the economic cycle, for 43 selected countries.**

	Number of projects/year			
	Growth	Recession	Average	Excess projects in recession
Transport	2,0	1,9	2,0	-6,8%
Energy	3,4	3,1	3,4	-6,0%
Building	0,9	2,9	1,1	174,6%
Water and sewerage	0,9	1,0	0,9	8,4%
Information and communication technology (ICT)	0,2	0,3	0,2	18,3%
Municipal Solid Waste	0,4	0,5	0,4	35,8%
Equipment	0,0	0,2	0,1	310,8%
Total	7,8	9,9	8,0	24,4%

731

732 **Table 6. Value of PPP projects that reach financial close depending on the phase of**
733 **the economic cycle, for 43 selected countries.**

	Value of projects (M USD)/year			
	Growth	Recession	Average	Excess investment in a recession
Transport	809	933	819	13,9%
Energy	708	610	700	-12,8%
Building	137	297	150	98,4%
Water and sewerage	94	118	96	22,5%
Information and communication technology (ICT)	81	41	78	-47,5%
Municipal Solid Waste	41	93	45	106,9%
Equipment	9	21	10	114,4%
Total	1.880	2.114	1.898	11,4%

734

735 **Table 7. Average PPP project size of projects that reach financial close depending**
736 **on the phase of the economic cycle, for 43 selected countries.**

	Value of project (M USD)/Project			
	Growth	Recession	Average	Excess project size in recession
Transport	400	498	408	22,2%
Energy	210	194	209	-7,2%
Building	151	101	140	-27,7%
Water and sewerage	105	120	107	13,0%
Information and communication technology (ICT)	387	162	366	-55,6%
Municipal Solid Waste	107	174	114	52,3%
Equipment	223	94	181	-47,8%
Total	240	213	237	-10,5%

737

738 **Table 8. Value of PPP Transport projects that reach financial close depending on**
739 **the phase of the economic cycle, for 43 selected countries.**

		Value of project (M USD)/year			
	Value of projects (M USD)	Growth	Recession	Average	Excess investment in a recession
Airports	118.959	106	37	100	-63,3%
Ports	80.440	71	31	68	-54,9%
Railways	190.175	156	203	160	27,0%
Roads	538.219	448	506	453	11,7%

740

Table 9. Value of PPP Energy projects that reach financial close depending on the phase of the economic cycle, for 43 selected countries.

		Value of project (M USD)/year			
	Value of projects (M USD)	Growth	Recession	Average	Excess investment in a recession
Uncategorized	410.190	375	244	364	-33,1%
Electricity, Natural Gas	70.868	65	86	66	29,5%
Electricity, Wind	62.976	58	133	64	109,6%
Electricity, Hydro	59.914	55	61	55	10,0%
Electricity, Thermal	51.161	47	10	44	-76,1%
Electricity, Solar	37.664	34	30	34	-11,0%
Electricity, Coal	35.366	32	16	31	-49,1%
Transmission Line	24.712	23	17	22	-21,4%

744 **Table 10. Number and value of PPP projects during the phases of the economic**
745 **cycle in OECD countries.**

	OECD				
	Number	Projects/year	Value (M USD)	Value (M USD) / year	Value (M USD)/Project
Growth	2,555	2.3	779,002	712	305
Recession	529	5.6	126,866	1,335	240
Total	3,084	2.6	905,868	762	294

746

Table 11. Number and value of PPP projects during the phases of the economic cycle in Non-OECD countries.

	Non-OECD				
	Number	Projects/year	Value (M USD)	Value (M USD) / year	Value (M USD)/Project
Growth	6,013	5.5	1,277,875	1,168	213
Recession	416	4.4	73,966	779	178
Total	6,429	5.4	1,351,841	1,137	210

Table 11. Main characteristics of the dataset used in the individual country analysis.

	Number of countries	Number of PPP projects	Value of PPP projects (M USD)
OECD Countries	15	2,901	860,291
Non-OECD Countries	18	5,611	1,226,545
Total	33	8,512	2,086,836
Total as a % of complete database	21%	85%	85%

754 **Table 12. Profile of PPP countercyclical countries.**

		Number of projects/year		Value of project (M USD)/year		Project size (M USD)	
	OECD Country?	Average	Excess projects in recession	Average	Excess value in recession	Average	Excess size in recession
Netherlands	Yes	1,88	397,1%	706	321,9%	376	-15%
Germany	Yes	4,49	247,3%	826	184,3%	184	-18%
Turkey	Yes	7,90	239,2%	4.772	173,9%	604	-19%
United Kingdom	Yes	34,49	129,3%	6.481	123,0%	188	-3%
Belgium	Yes	1,35	147,5%	374	112,4%	277	-14%
Bulgaria	No	3,33	215,0%	334	111,9%	100	-33%
France	Yes	6,62	153,7%	1.733	85,2%	262	-27%
Romania	No	4,29	-37,8%	615	62,9%	143	162%
Portugal	Yes	1,63	8,1%	971	11,4%	594	5%

755

756

Figures

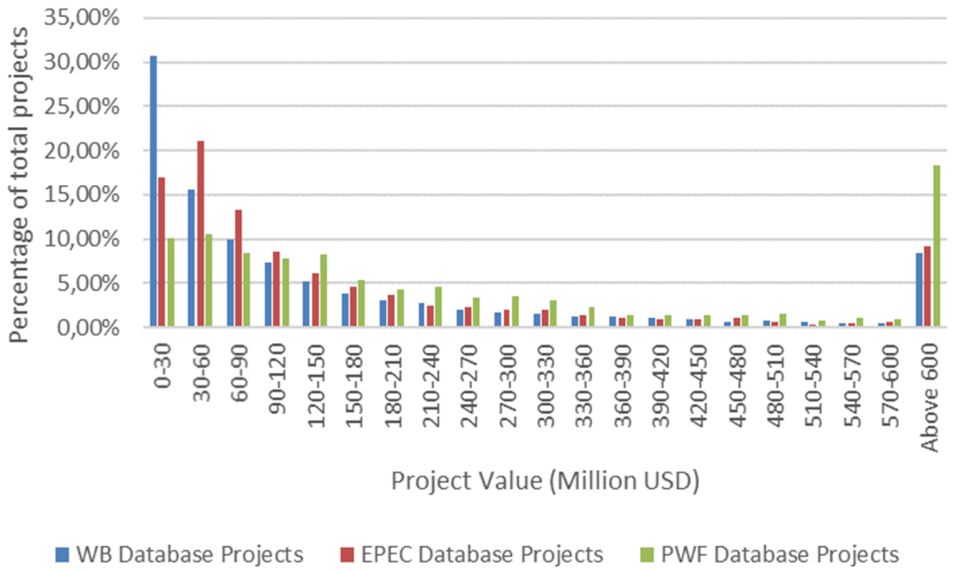


Figure 7. Distribution of the number of projects included in the Databases according to project size.

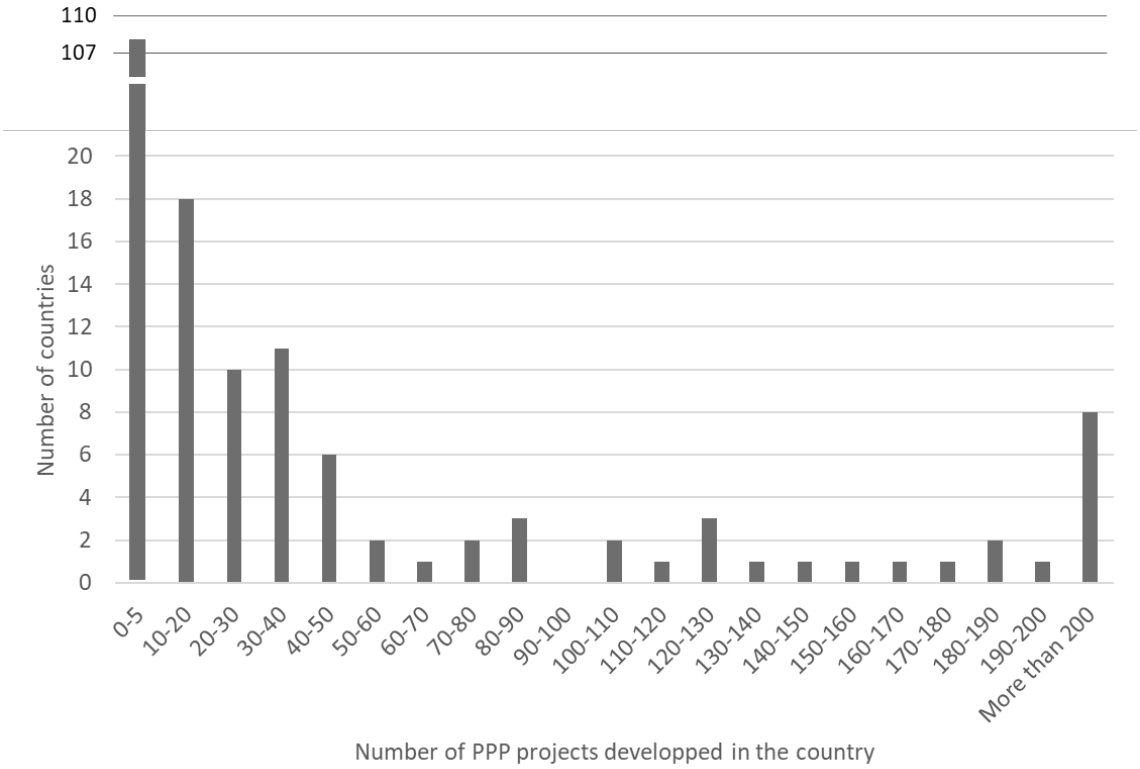


Figure 8. Distribution of countries according to the number of PPP projects developed.

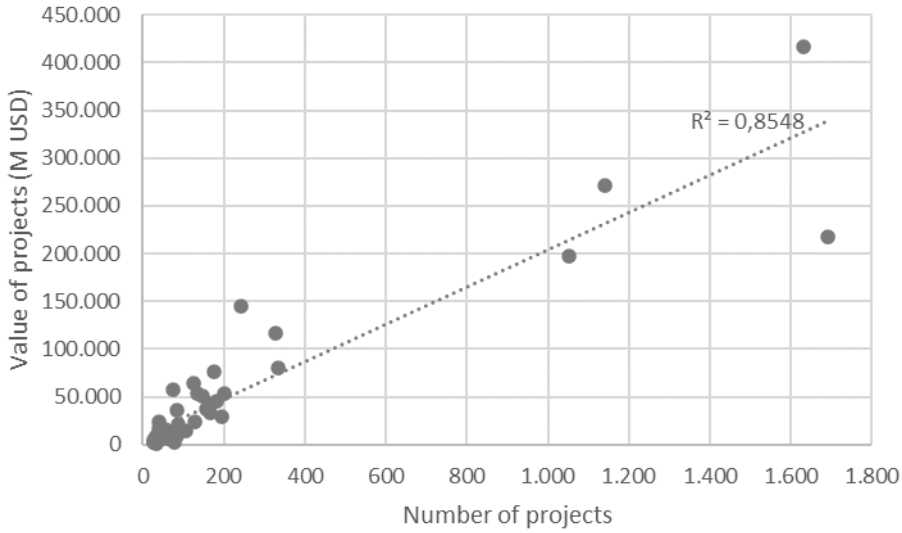


Figure 9. Number of PPP projects and total value of PPP projects in countries with more than 25 PPP projects.

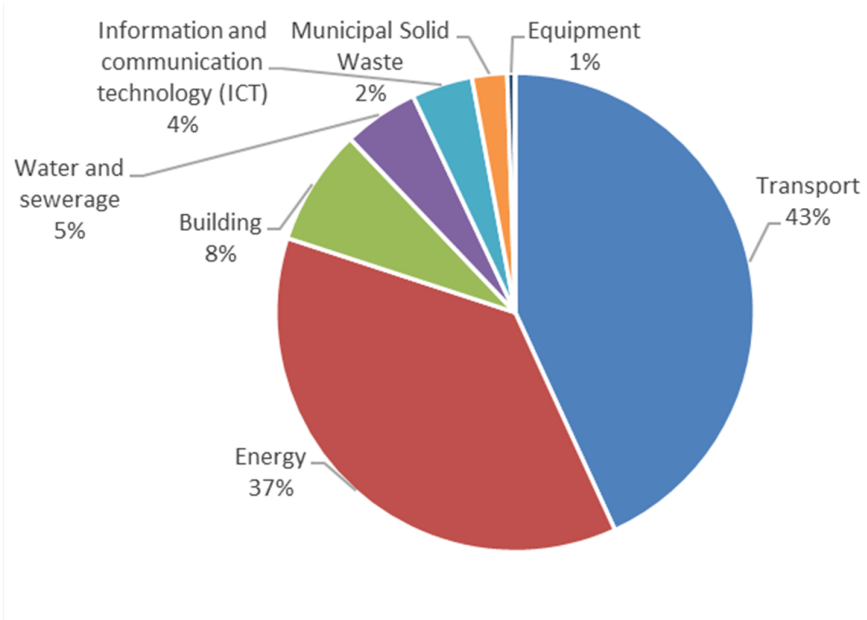
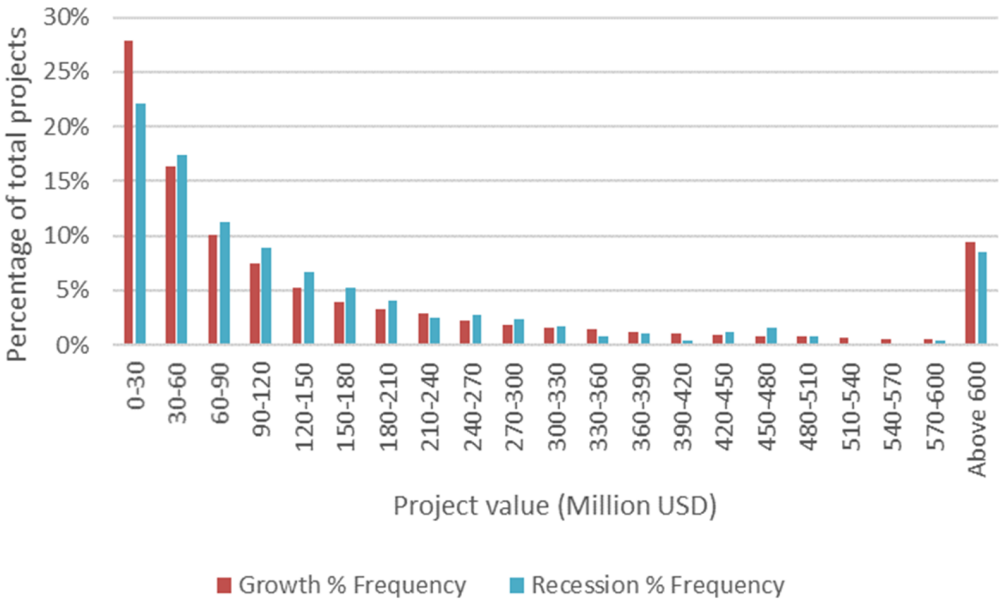


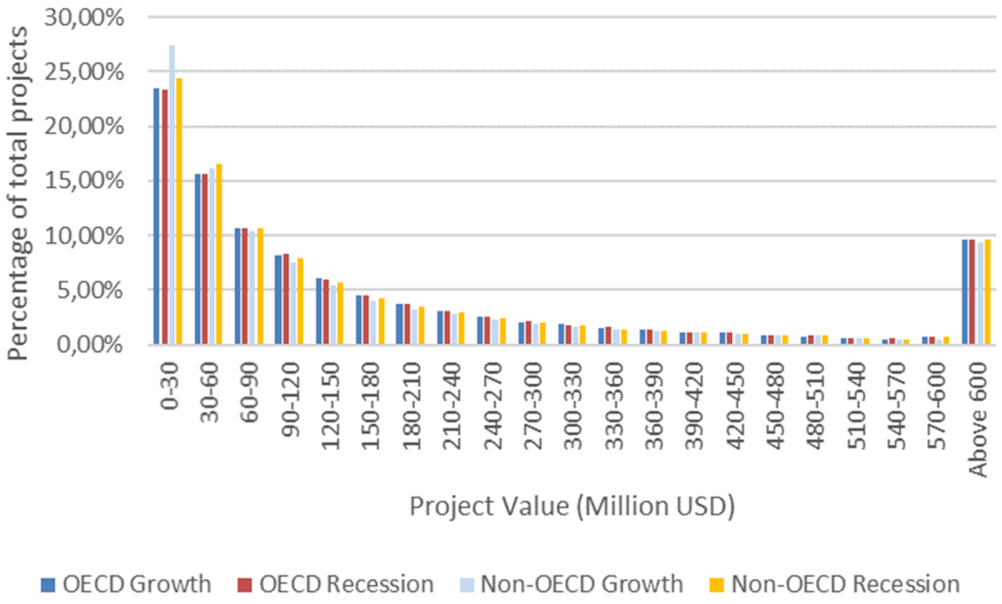
Figure 10. Value distribution by field of the PPP projects in the 43 countries included in the study.



775

776 **Figure 11. Distribution of PPP projects according to project value.**

777

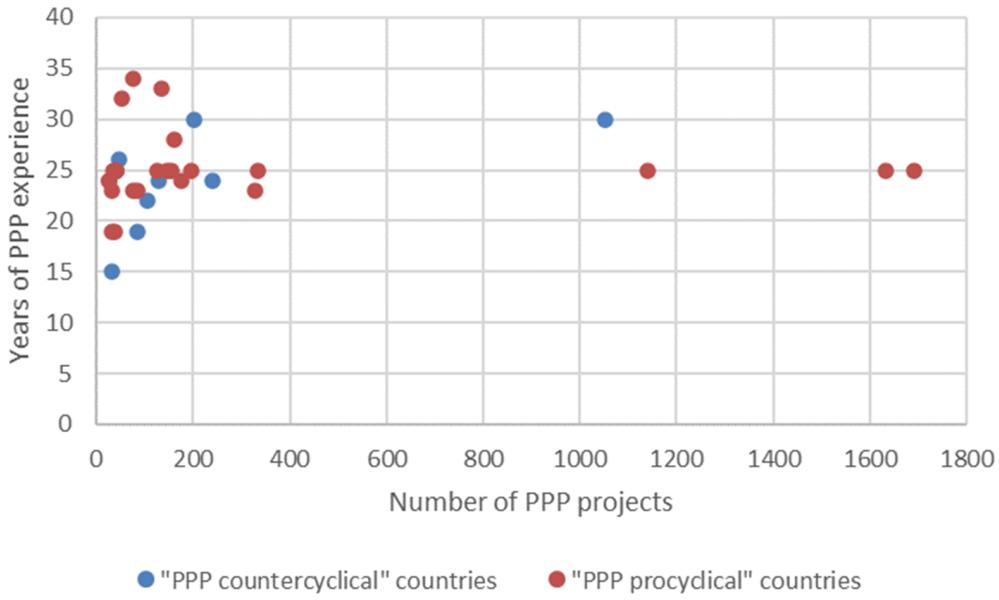


778

779 **Figure 12. Distribution of PPP projects according to project value – developed vs**

780 **developing countries.**

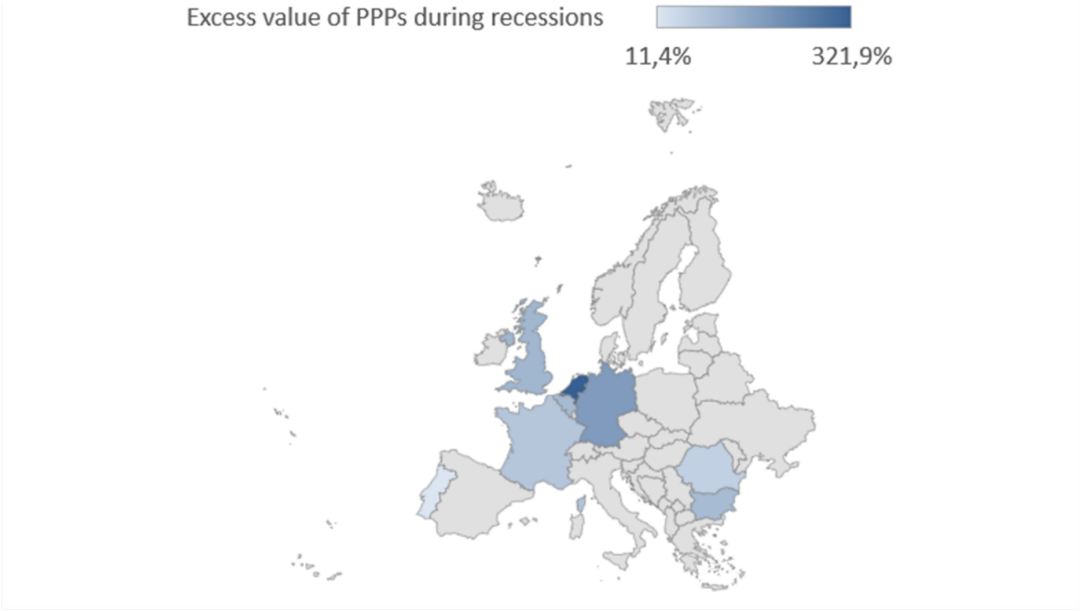
781



782

783 **Figure 7. Number of PPP projects and years of experience with PPPs.**

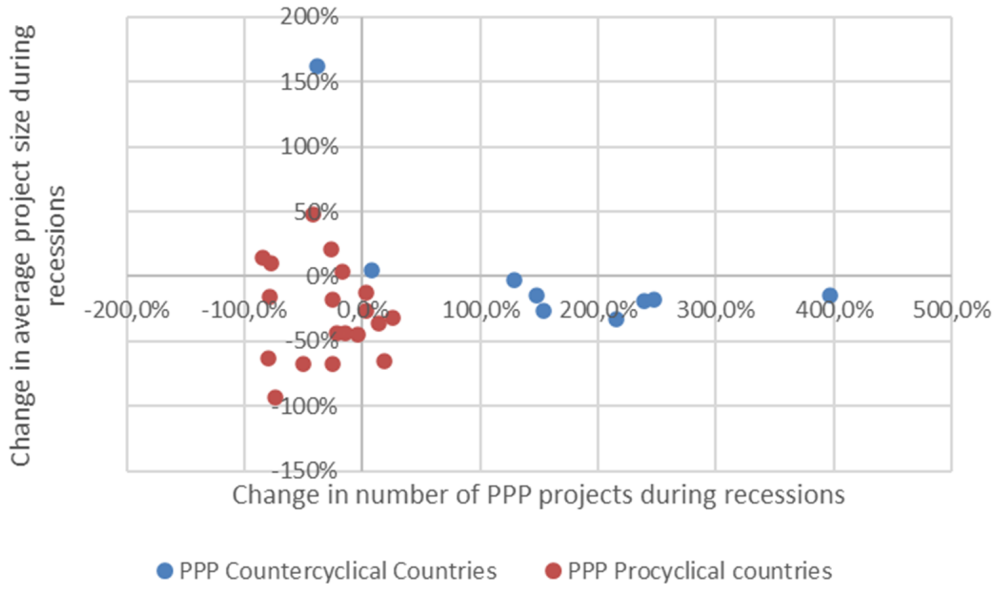
784



785

786 **Figure 8. PPP Countercyclical countries (except Turkey).**

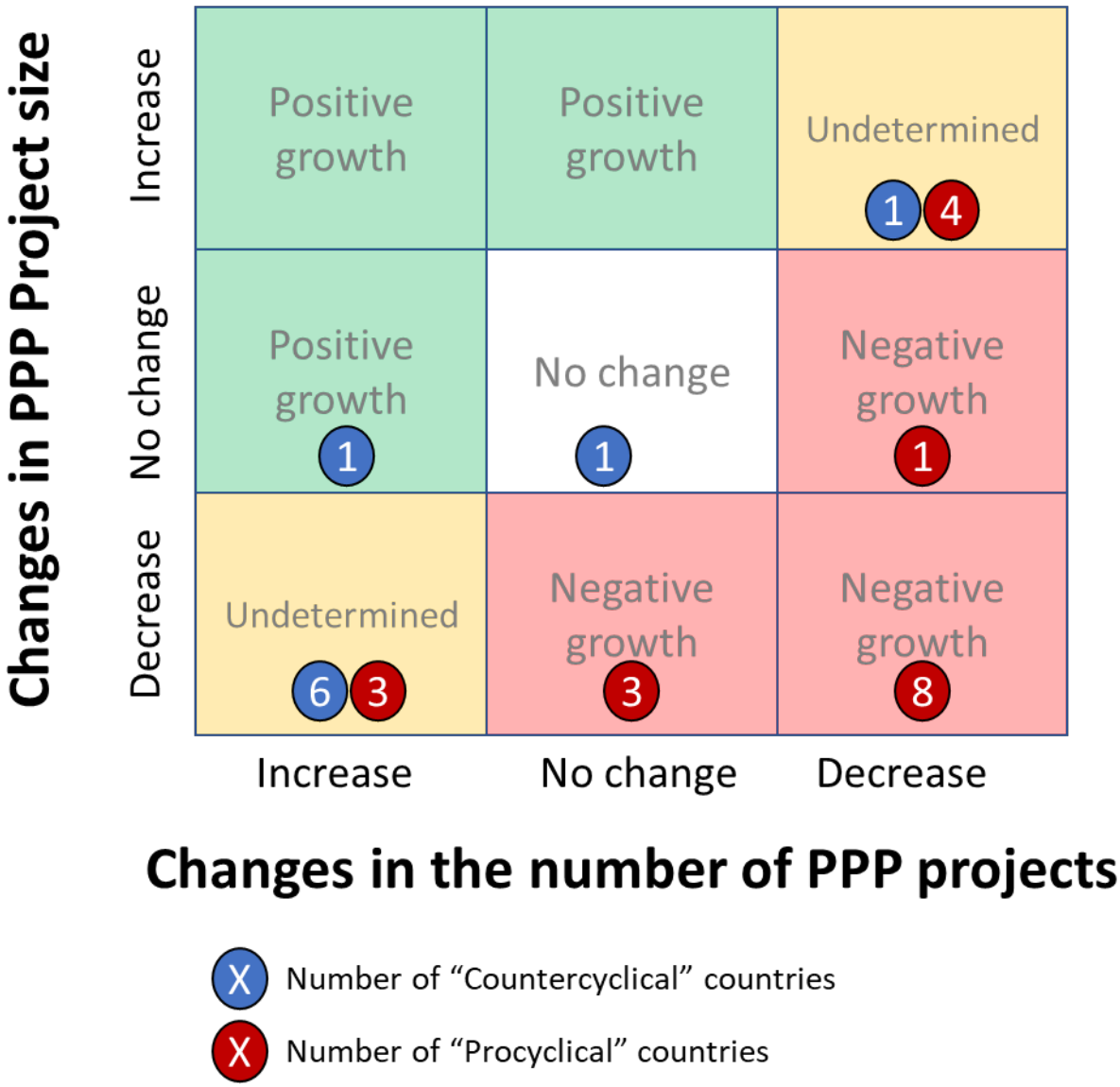
787



788

789 **Figure 9. Changes in the number of PPP projects and average PPP project size**
790 **that reach financial close during recessions.**

791



792

793 **Figure 10. Country classification according to the strategy followed to achieve**
794 **excess PPP value growth during recessions.**

795

796

797 **Figure captions**

798 Figure 1. Distribution of the number of projects included in the Databases according to

799 project size.

800 Figure 2. Distribution of countries according to the number of PPP projects developed.

801 Figure 3. Number of PPP projects and total value of PPP projects in countries with more
802 than 25 PPP projects.

803 Figure 4. Value distribution by field of the PPP projects in the 43 countries included in
804 the study.

805 Figure 5. Distribution of PPP projects according to project value.

806 Figure 6. Distribution of PPP projects according to project value – developed vs
807 developing countries.

808 Figure 7. Number of PPP projects and years of experience with PPPs.

809 Figure 8. PPP Countercyclical countries (except Turkey).

810 Figure 9. Changes in the number of PPP projects and average PPP project size that
811 reach financial close during recessions.

812 Figure 10. Country classification according to the strategy followed to achieve excess
813 PPP value growth during recessions.