The evolution of macroprudential policy use in Chile

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Abstract

Using several international datasets on the use of macroprudential policies and capital flows controls across several countries, this study compares the use of financial regulations in Chile versus other countries. We find that in 2019 Chile makes an overall use of macroprudential policies as the Advanced Economies (AEs) and OECD countries, although its policies are less restrictive than the other Emerging Markets (EMs), Latin American countries (LAC and LA-6). However, Chile's updating of its prudential framework lagged the Advanced Economies (AEs) and OECD, which started tightening its financial regulations since 2009. In particular, Chile became similar to the Advanced Economies (AEs) and OECD countries in its Institutional macroprudential policies such as SIFI capital surcharges, while other Emerging Markets (EMs) and Latin American countries (LAC and LA-6) make less use of such regulations. Chile implemented a smaller tightening of loan supply and loan demand restrictive policies, except for the mortgage Loan-to-Value regulation. The mortgage Loan-to-Value is a regulation quite restrictive in Chile and Latin America (LAC and LA-6), although it became less restrictive across other Emerging Markets (EMs), Advanced Economies (AEs) and OECD countries. Chile is similar to Emerging Markets (EMs) and Latin America (LAC and LA-6) in terms of supply of capital and general supply macroprudential restrictions, but it is more restrictive in such policies than the Advanced Economies (AEs) and OECD countries.

In terms of Financial Openness and Capital Flows restrictions, we show that Chile became quite closed after the Banking crisis of 1982, but quickly opened its financial system to outside flows after 1999. However, Chile - like the rest of Latin America (LAC and LA-6) - reduced

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its financial openness and tightened some of its capital flows policies between 2008 and 2012. The Advanced Economies (AEs), OECD and Emerging Markets (EMs) have kept an increasing trend in financial openness for the whole period, a process which started in the 1970s after the end of Bretton Woods.

Finally, we summarize some evidence on the effects of macroprudential policies on the average growth and volatility of different manufactures. In particular, we find that industries with high external finance dependence suffer from periods with high macroprudential tightness. However, macroprudential policies also reduce the volatility of manufacturing growth. Therefore there is a strong trade-off between average growth and volatility when considering the effects of macroprudential regulations.

JEL Classification: E44; G28; O10; O16.

Keywords: Macroprudential policy; Financial development; Growth; Volatility.

1 Introduction

After several financial crises in the last 30 years - such as the Asian crisis (1997), the Global Financial Crisis (2008) or the European sovereign debt crisis (2010) - regulators across several countries have adopted stronger bank capital requirements and other regulations. The use of other regulations such as capital flows controls has also shifted over time (Fernández et al. 2016, Acosta-Henao et al. 2020). Macroprudential policies are increasingly in use by both advanced and emerging economies, especially after the global financial crisis (Alam et al. 2019, Cerutti et al. 2017). Recent works find a negative impact of macroprudential policies (MaPPs) on the growth of financially dependent industries (Madeira 2020), housing prices, mortgages, total credit, household credit, corporate credit (Cerutti et al. 2017, Akinci and Olmstead-Rumsey 2018), a mild dampening effect on consumption (Alam et al. 2019), a positive effect on income inequality (Frost and van Stralen 2018) and a reduction in the incidence of credit booms (Dell'Ariccia et al. 2012).

This study uses integrated Macroprudential Policy (iMaPP) database of the International Monetary Fund (IMF) for 134 countries to compare the evolution of 17 different macroprudential policies in Chile and the rest of the world during the period from 1990 to 2016 (Alam et al. 2019). In particular, we compare Chile to the current OECD members, the Advanced-Economies (AEs), Low Income Countries (LICs), Emerging Markets (excluding LICs), Latin American and the Caribbean (LAC), and the LA-6 (Argentina, Brasil, Chile, Colombia, Mexico, Peru). In 2018, of the 100 countries that have adopted the risk-based capital (RBC) regime, 60 countries were under Basel III, 10 countries were under Basel II, with Chile being one of the 30 countries that kept the Basel I framework and lagged its peers in terms of modern financial regulation. Between 1990 and 2018, Chile suffered few changes to its banking regulatory framework. However, with the new General Banking Law legislated on January of 2019, Chile advanced to a full Basel III regime and became comparable to the Advanced Economies (AEs) and other countries that adopted Basel III. Therefore since 1990 until now Chile tightened its macroprudential policies in a comparable way as the average of the Advanced Economies (AEs) and the OECD countries, although the macroprudential tightening was significantly below the one implemented by the average of the Emerging Markets (EMs), the Latin American and Caribbean (LAC) or the LA-6 regions. Finally, the iMaPP-IMF dataset shows that Chile substantially increased its Loan-to-Value restrictions in

2009, a much stronger tightening for this policy than shown by the other countries.

Using datasets specific to capital flows macroprudential policies, such as the Financial Openness Index (Chinn and Ito 2006), the Capital Inflows Tightening Index (Pasricha 2017), and the Capital Controls Index (Fernández et al. 2016), we find that Chile became more open after the Asian crisis and the end of its exchange-rate band target in 1999, although this Financial Openness decreased somewhat during the period of 2008 to 2012.

This paper is organized as follows. Section 2 describes the data sources for the Macroprudential policies indexes across different countries. Section 3 shows how Chile compares with other economies across different sets of macroprudential policies in the iMaPP-IMF dataset. Section 4 summarizes how Chile evolved in terms of its capital controls indexes and how it compares with other countries. Section 5 summarizes estimates of the impact of macroprudential policy on the growth of different manufacturing industries according to their external finance dependence (Madeira 2020). Finally, Section 6 concludes with a summary of the findings and its policy implications.

1.1 Data

The main reference for this study of macroprudential policies is the iMaPP (integrated Macroprudential Policy) database published by the IMF, which is thoroughly described in the work by Alam et al. (2019). The iMaPP dataset provides a set of 17 macroprudential indexes (with values +1,0-1, for tightening, no change and easing, respectively) for each country c at time t since 1990, with the 17 individual policies being: Loan-to-value (LTV), Debt Service to Income (DSTI), Limits on Credit Growth (LCG), Loan Loss Provisions (LLP), Loan restrictions (LoanR), Limits and penalties to the loan-to-deposit (LTD), Limits on foreign currency lending (LFC), Reserve Requirements (RR), Liquidity, Limits on foreign exchange exposure (LFX), Leverage limits or unweighted Leverage Ratio (LVR), Countercyclical buffers (CCB), Conservation buffer, Capital requirements, Tax measures, measures to mitigate risks from Systemically Important Financial Institutions (SIFI), Other measures (such as stress testing, restrictions on profit distribution and limits on exposures between financial institutions).

These measures can be grouped in 5 categories: Loan Demand (LTV, DSTI), Loan Supply (LCG, LLP, LoanR, LTD, LFC), Supply general (RR, Liquidity, LFX), Supply capital (LVR, CCB,

Conservation buffer, Capital requirements), Institutional (Tax, SIFI, Other). These 5 categories can be further grouped in just 3 broad categories: Loan total (Loan Demand, Loan Supply), Supply total (Supply general, Supply capital), Institutional. Finally, the iMaPP database reports a Total Macroprudential Policy index ($TPP_{c,t} = \sum_k PP_{c,t}^k$), which corresponds to the sum of the individual 17 macroprudential policies ($PP_{c,t}^k$). I then build cumulative policy stances (since 1990 until year t) for each one of these 17 macroprudential policies, its 5 categories, plus the 3 broader categories and the Total Macroprudential Policy index: $CPP_{c,t}^k = \sum_{t=1}^t PP_{c,t}^k$, with the Cumulative Total Macroprudential Policy index being given by $CTPP_{c,t} = \sum_k CPP_{c,t}^k$. Although the iMaPP dataset is monthly, for simplicity we show the results at a yearly frequency (which is equivalent to the months of December of each year t).

The iMaPP-IMF dataset is based on source documents and evaluations from the Financial Stability Board (FSB), International Monetary Fund (IMF), academic papers, national sources and IMF surveys sent to the national regulators (Alam et al. 2019). One problem of this dataset is that there is a substantial degree of subjective judgement influencing the answers given by the employees of the national regulators, such as whether a certain policy change constitutes or not a policy tightening or easing and when such a change was implemented (if it was when the legislation was announced or when the policy was put in actual use). A second problem is that the iMaPP dataset only reports the policy tightening or easing, but not the intensity measure of the tightening and easing policies. Therefore it is possible that in a certain country one action of policy tightening more than compensated two or more easing policy events, but this is not possible to account for in our analysis. Finally, a third problem is that policy tightening and easing is measured relative to each country's situation in 1990, therefore some countries may have started that period with policies that were too conservative or liberal relative to its peers.

Our study also uses another piece of policy information from the iMaPP dataset, which is a continuous measure of the average mortgage Loan-to-Value (LTV) for 66 countries since 2000. This measure includes the intensity of the policy tightening or easing implemented by each country. However, it is available for a smaller number of countries and it is also subject to a significant degree of subjective judgment from the national authorities reporting such an indicator, since some countries may have different LTV policies for mortgages of different size, for households paying their first mortgage versus households and investor paying mortgages on secondary properties.

In the case of Chile, our analysis extends the iMaPP time series until 2019 by considering no policy changes in 2017 and 2018, and then including 5 policy tightening changes implemented in 2019 ($TPP_{c,t} = 5$) with the new General Banking Law of Chile (January of 2019) updating the Chilean regulatory framework towards the Basel III standards: Capital requirements (+1), Conservation buffer (+1), Liquidity requirements (+1), SIFI (+1), LVR (+1).

Later, based on Madeira (2020), we provide a summary of the impact of macroprudential policies on the manufacturing industries growth. For this analysis, Madeira (2020) combines the iMaPP dataset with the UNIDO's Industrial Statistics Database (Indstat2 - revision 3), which contains annual frequency data for the 2-digit ISIC (International Standard Industrial Classification of All Economic Activities) industries of each country from 1963 onwards. It comprises data on 23 manufacturing industries. I measure industrial growth as the log increase in the Index of Industrial Production (IIP), $g_{i,c,t} = \ln(\dfrac{IIP_{i,c,t}}{IIP_{i,c,t-1}})$, which takes into account sector-specific price indexes. The dataset is unbalanced with some pairs of countries-industries with missing data in several years, and also with some countries reporting fewer industries. Madeira (2020) then tests whether manufacturing growth differs with the External Finance Dependence index (EFD_i, obtained from Rajan and Zingales 1998) across different industrial sectors.

We also use three datasets specific to capital flows policies: i) the Financial Openness Index (Chinn-Ito 2006), ii) the Capital Inflows Tightening Index (Pasricha 2017), iii) the Capital Controls Index (Fernández et al. 2016). The Financial Openness Index (Chinn-Ito 2006) is the normalization of 4 indicators for each country since 1970: multiple exchange rates, current account restrictions, capital flows restrictions, taxes or restrictions on exports. The Capital Inflows Tightening Policy Index (Pasricha 2017) directly measures policy actions by 18 major emerging market economies since 2000 along six dimensions: 1) Inflow/Outflow, 2) Easing/Tightening, 3) Capital Control/Currency Based, 4) Prudential Type, 5) Index of Industrial Production (IIP) Category (Foreign Direct Investment (FDI), Portfolio Investment, Other investment, Financial Derivatives), 6) Quantitative/Price/Monitorin These Pasricha (2017) indexes are reported in terms of weighted net flows controls, weighted net inflows and weighted net outflows. The Capital Controls Index (Fernández et al. 2016) capital control measures the restrictions (with 1 representing a restriction and 0 no restriction) on both inflows and outflows of 10 categories of assets for 100 countries since 1995, with the 10 asset classes including: equity, bonds, money market, collective investment, financial credit, foreign

direct investment, derivatives, commercial credit, financial guarantees, and real estate. Note that these capital flows restriction datasets have a similar disadvantage as the iMaPP set of indexes, because both the Capital Inflows Tightening Policy Index (Pasricha 2017) and the Capital Controls Index (Fernández et al. 2016) are a sum of dummy policy indicators and therefore do not take into account the intensity of the policy measures.

Each one of this datasets has a different number of countries available, therefore the groups for which Chile is compared against differ slightly among datasets. The appendix at the end of this article gives a detailed list of the countries in each dataset. The Chinn-Ito (2006), the iMaPP-IMF and Fernández et al. (2016) datasets are quite extensive, including 182, 135 and 100 countries, respectively. The iMaPP mean LTV measure, however, is only available for 66 countries, unlike the dummy type indicators. The Pasricha (2017) dataset is available for only 18 countries and therefore is the one with fewer possibilities for comparison at the international level. The next sections compares Chile to the unweighted averages of the OECD, the Advanced-Economies (AEs), Low Income Countries (LICs), Emerging Markets (excluding LICs), Latin American and the Caribbean (LAC), and the LA-6 (Argentina, Brasil, Chile, Colombia, Mexico, Peru).

2   Comparison of Chile with other economies in terms of Macroprudential policies

2.1   Overall Macroprudential index

We first present in Figure 1 the overall Macroprudential Policy Tightening Index (iMaPP-IMF) in the most recent period, which is 2016 for the 135 countries of the dataset although we updated the data for Chile to reflect the new General Banking Law of 2019. It shows that the net sum of tightening policies (that is, tightening minus easing decisions) in 2019 was 4 for Chile, indicating a significant degree of macroprudential restrictions implemented since 1990. This value is very close to the 4.5 net tightening index implemented by the Advanced Economies (AEs) and the 4.3 index of the average OECD country. It is also very close to the 4.1 index of the Low Income Countries (LICs), although such economies have less well developed banking systems and financial

Figure 1: iMaPP policy Macroprudential net tightening index (cumulative sum of 17 policies since 1990): comparing Chile in 2019 with the other countries in 2016
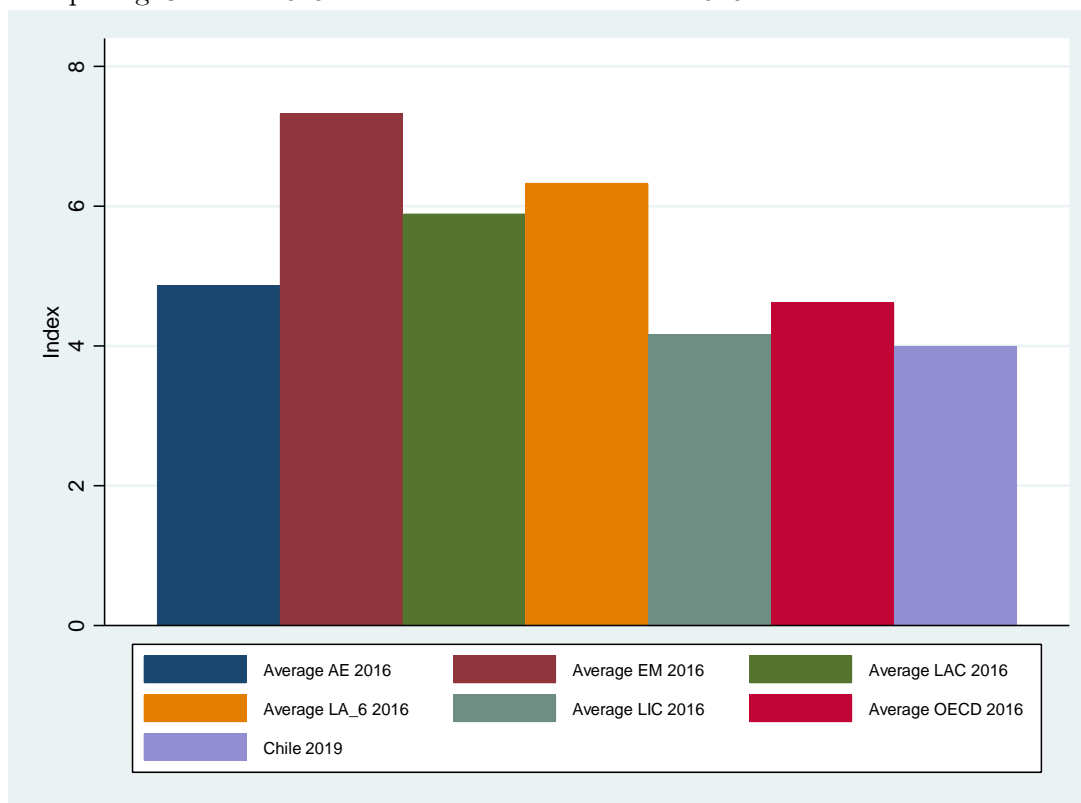
markets and could be at a stage of development that still requires financial easing rather than tightening policies (Madeira 2020). The average Emerging Market country (EMs), the average Latin American country (LAC) and the average of the LA-6 members, however, implemented a policy tightening index of 7.5, 5.9 and 6.1, therefore being significantly more conservative than Chile and the Advanced Economies (AEs).

Now Figure 2 shows how Chile and the other groups of countries changed their net tightening policy since 1990. It shows that Chile tightened its policies significantly in 1992 and then kept a net tightening around 2 until 1998. This evolution was unlike the other groups of countries during the 1990s. There was a very small net tightening in the case of Latin America (LAC or LA-6) and the Low Income Countries (LICs), while the OECD, the Advanced Economies (AEs) and the Emerging Markets (EMs) in fact eased their policies (therefore presenting a negative net tightening index). Then Chile eased its net macroprudential tightening in 1998 and again in 2009, which was

Figure 2: Macroprudential net tightening index (cumulative sum of 17 policies) since 1990

against the trend of Latin America (LAC or LA-6) and the Low Income Countries (LICs) which kept tightening their policies considerably during the 2000s. The average OECD country, Advanced Economy (AEs) and Emerging Market (EMs), however, started a process of net policy tightening in 2008 after the Great Financial Crisis. Therefore by 2009 Chile had a significantly lower net policy tightening than all the other groups of countries (whether AEs, OECD, EMs, LICs, LAC or LA-6). This tendency of Chile to stay behind the policy tightening shown by the other countries was exacerbated until 2016. Only with the new General Banking Law in 2019 did Chile catch up with the tightening policy emphasis of the OECD and the Advanced Economies (AEs).

In the case of the average mortgage Loan-to-Value (LTV) regulation, again Chile differed from the other countries (Figure 3). While the LTV stayed roughly the same at a level of 98% for the Latin America (LAC and LA-6) countries over the entire period of 2000 to 2015, in the case of Chile the LTV was increased in 2009 from 87% to 100%. This LTV policy tightening in Chile and Latin America differed from the other groups of countries, with the OECD, the Advanced Economies

Figure 3: Average mortgage LTV limit (in %)
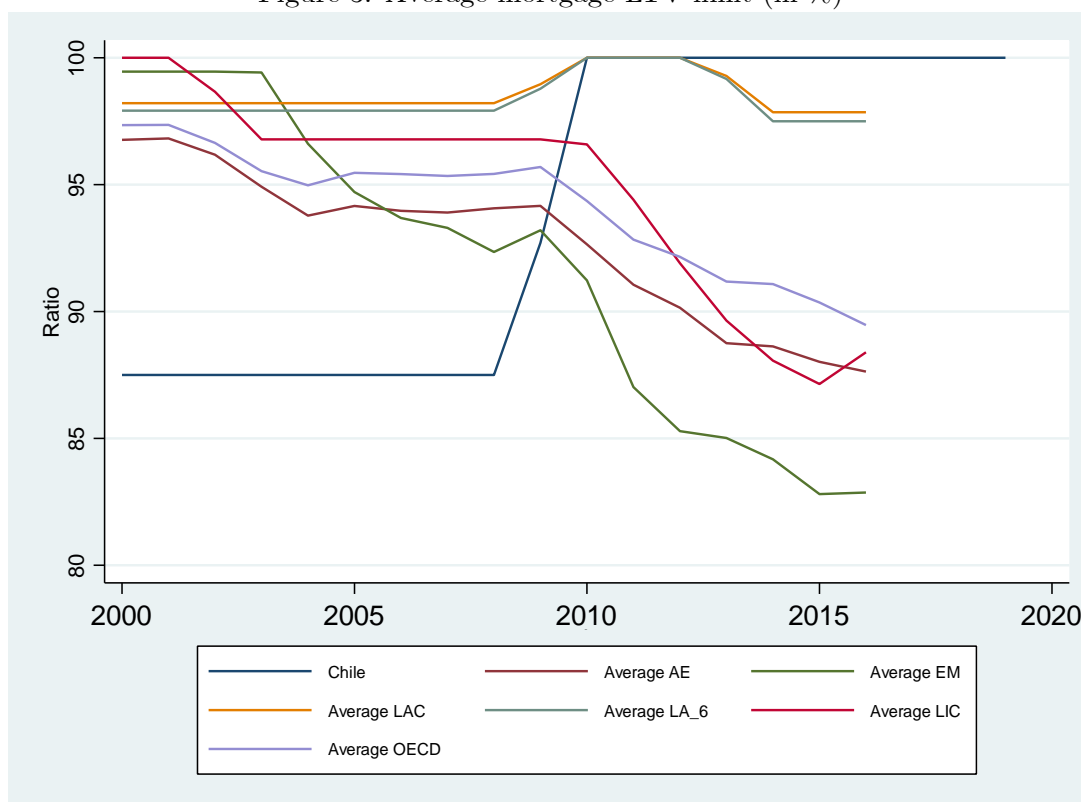
(AEs), the Emerging Markets (EMs) and the Low Income Countries (LICs), which substantially decreased their mortgage LTV after 2009. By 2016, the average LTV was between 88% and 90% for the OECD, the Advanced Economies (AEs) and the Low Income Countries (LICs) and Aaron 83% for the Emerging Markets (EMs). In this policy aspect, Chile implemented a much stronger tightening and conservative policy than the remaining groups of countries outside Latin America.

2.2 Loan demand and supply indexes

In terms of the tightening of the Loan related policy instruments, Figure 4 shows that Chile eased such policies (Loan Sum = Loan Demand + Loan Supply) since 1990 until now, while all the other countries implemented 1 to 2.5 policy tightenings. In particular, the OECD, the Advanced Economies (AEs), the Emerging Markets (EMs) implemented between 2 to 2.5 Loan policy tightenings, while Latin America (LAC and LA-6) implemented 1 policy tightening and

Figure 4: Loan Sum (Loan Demand + Loan Supply) net tightening (since 1990)
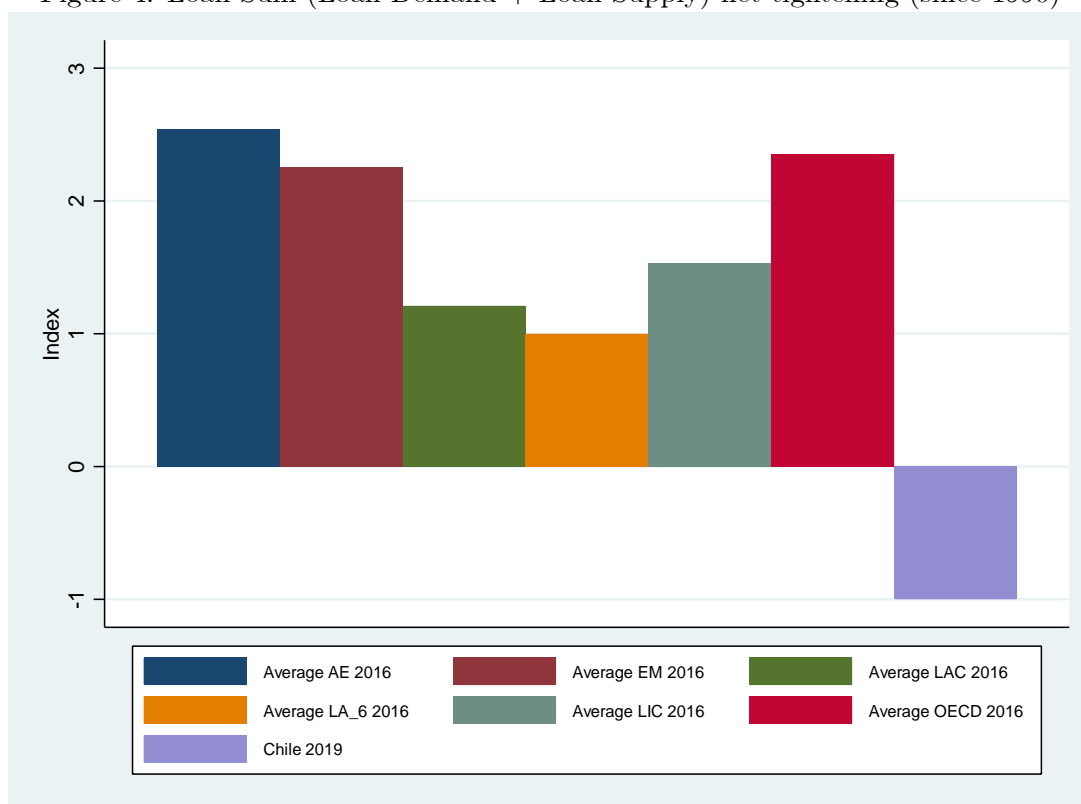
the average Low Income Country (LICs) implemented 1.5 net tightenings. This difference is due to both the Loan Demand (Figure 5), defined as the sum of the Loan-to-Value (LTV) + Debt Service to Income (DSTI) tightenings, and the Loan Supply (Figure 6), the sum of the Limits on Credit Growth (LCG) + Loan Loss Provisions (LLP) + Loan restrictions (LoanR) + Limits and penalties to the loan-to-deposit (LTD) + Limits on foreign currency lending (LFC) tightenings. The average Advanced Economy (AEs) and OECD member implemented a tightening of 1.5 for the Loan Demand policies and a tightening of 1 for the Loan Supply policies. The average Emerging Market (EMs) and Latin American (LAC) country implemented a respective policy tightening of 1 and 0.5 for both Loan Demand and Loan Supply. Chile differed from the rest of the countries in presenting no policy changes for Loan Supply and a policy easing for Loan Demand, although the policy easing for Loan Demand fails to account that the LTV in Chile experienced two small reductions during the 1990s and one large increase in 2009.

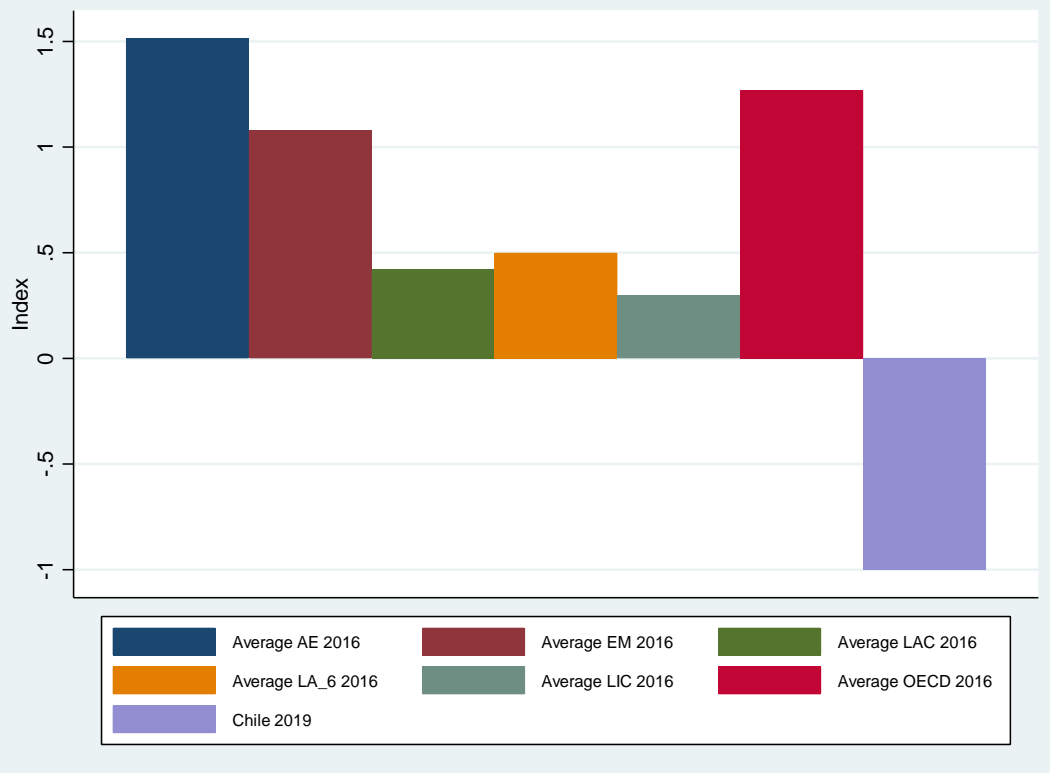Figure 5: Loan Demand (LTV + DSTI) policy tightening (since 1990) index
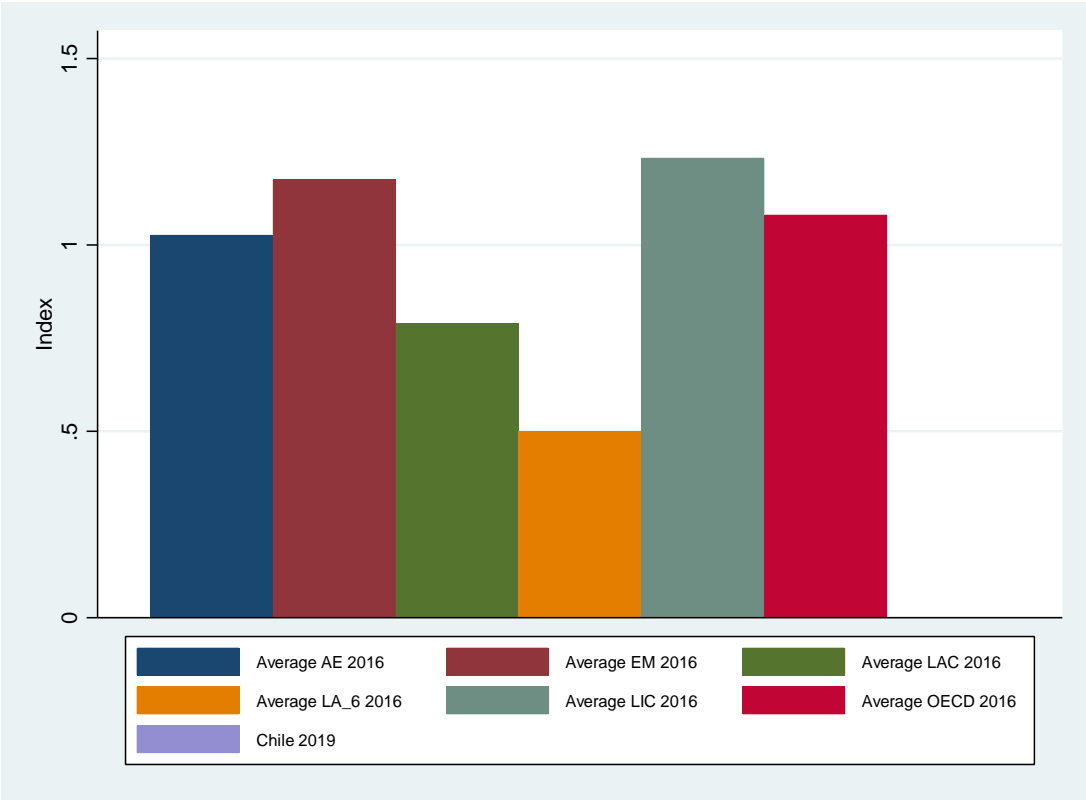
Figure 6: Loan Supply (LCG + LLP + LoanR + LTD + LFC) policy tightening (since 1990) index

2.3 Supply of capital

In terms of the Supply (Sum = Supply general + Supply capital) related policies (Figure 7), we find that Chile implemented a significant net tightening of 4 since 1990, which is very similar to the average Emerging Market (EMs) and Latin America country (LAC and LA-6), while the Low Income Countries (LICs) implemented a net tightening of 2.7. The Advanced Economies (AEs) and the OECD implemented a Supply net tightening of 0.9. Therefore for Supply policies, the Advanced Economies (AEs) and the OECD were less conservative than Chile and the other regions.

Chile presented a net tightening of 3 in terms of the Supply of capital (Unweighted Leverage Ratio (LVR) + Countercyclical Buffers (CCB) + Conservation buffer + Capital requirements) policies since 1990 (Figure 8), while the Advanced Economies (AEs), OECD and large Latin American countries (LA-6) presented a net tightening close to 2. Therefore Chile's current regulatory framework is more conservative in terms of Supply of capital policies than the other regions. Due to their lower development, the Advanced Economies (AEs) and the average Latin America country (LAC) only implemented a policy tightening of 1 in this aspect.

For the Supply general (Reserve Requirements + Liquidity + Limits on foreign exchange exposure) policies, Figure 9 shows that Chile tightened these policies by 1, although both the Advanced Economies (AEs) and the OECD eased these policies since 1990. However, the average Emerging Market (EMs), Latin America country (LAC and LA-6) and Low Income Country (LICs) tightened the Supply general policies by 3 since 1990, an even more conservative policy than Chile.

2.4 Institutional regulations and other policies

Finally, in Figure 10 we show the Institutional (Tax + Systemically Important Financial Institutions surcharges (SIFI) + Other) regulatory framework in the most recent year for Chile versus the other countries. Chile implemented a net tightening of 1 for these policies since 1990 (which corresponds to a SIFI capital surcharge legislated in 2019). The policy tightening in Chile is slightly below the 1.2 and 1.5 values of the OECD and the Advanced Economies (AEs), while being above the values around 0.5 for the Emerging Markets (EMs) and Latin American countries (LAC). The Low Income Countries (LICs), however, did not change their policies in this aspect since 1990, perhaps

Figure 7: Supply Sum (Supply general + Supply of capital) net tightening index (since 1990)
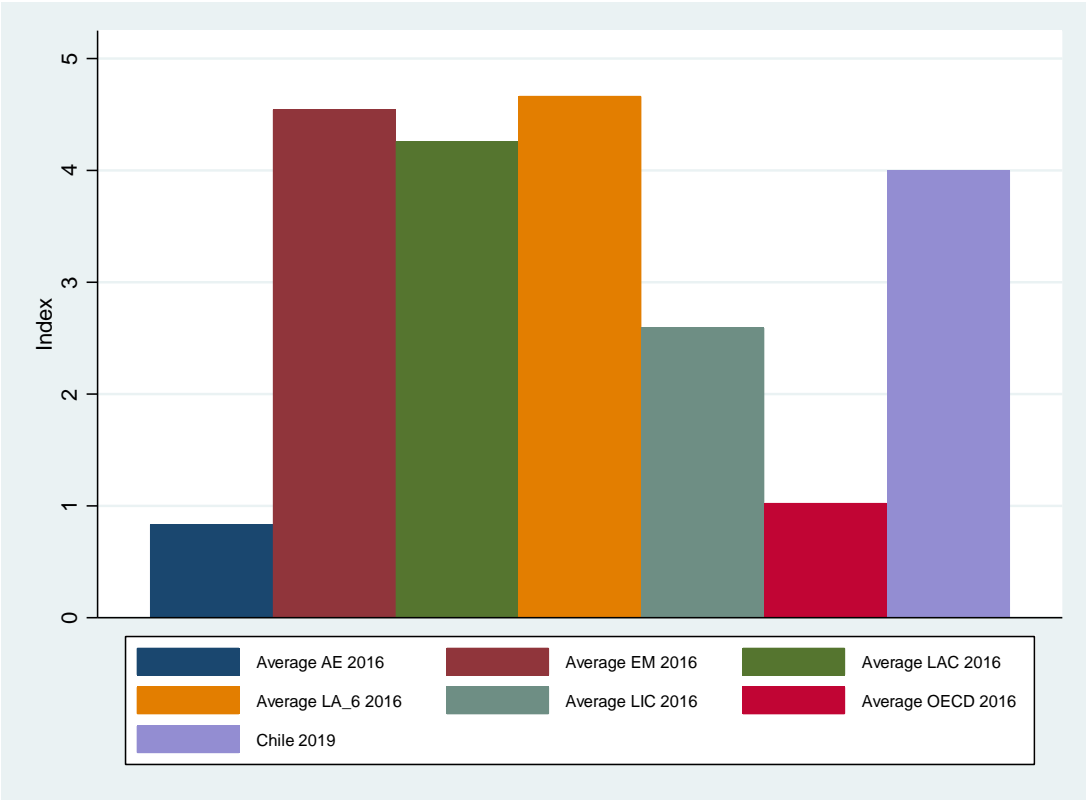
Figure 8: Supply of capital (LVR + CCB + Conservation + Capital) net tightening index (since 1990)
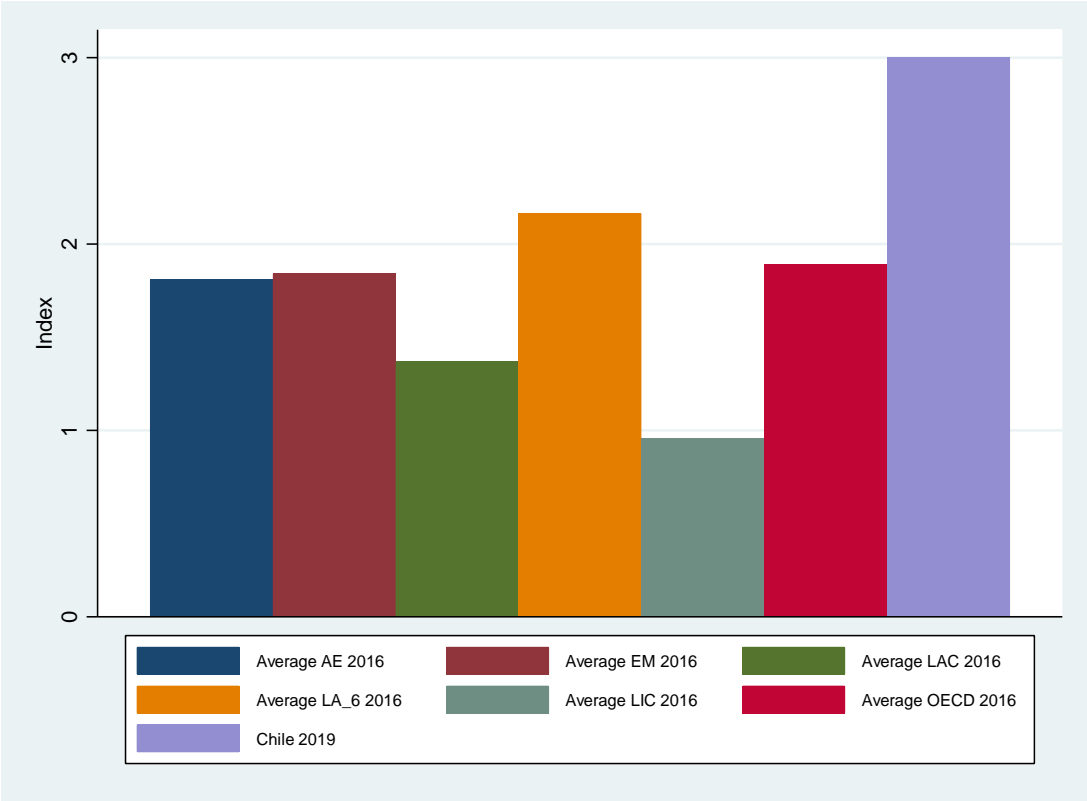
Figure 9: Supply general (RR+Liquidity+LFX) net tightening index (since 1990)
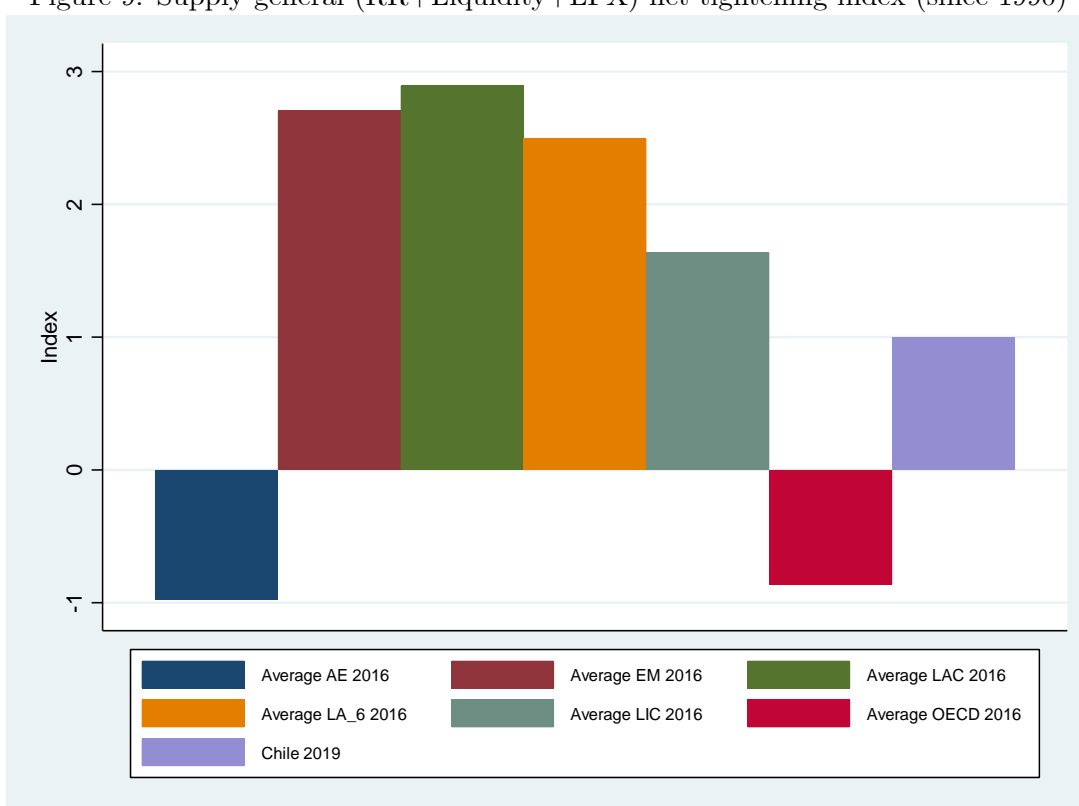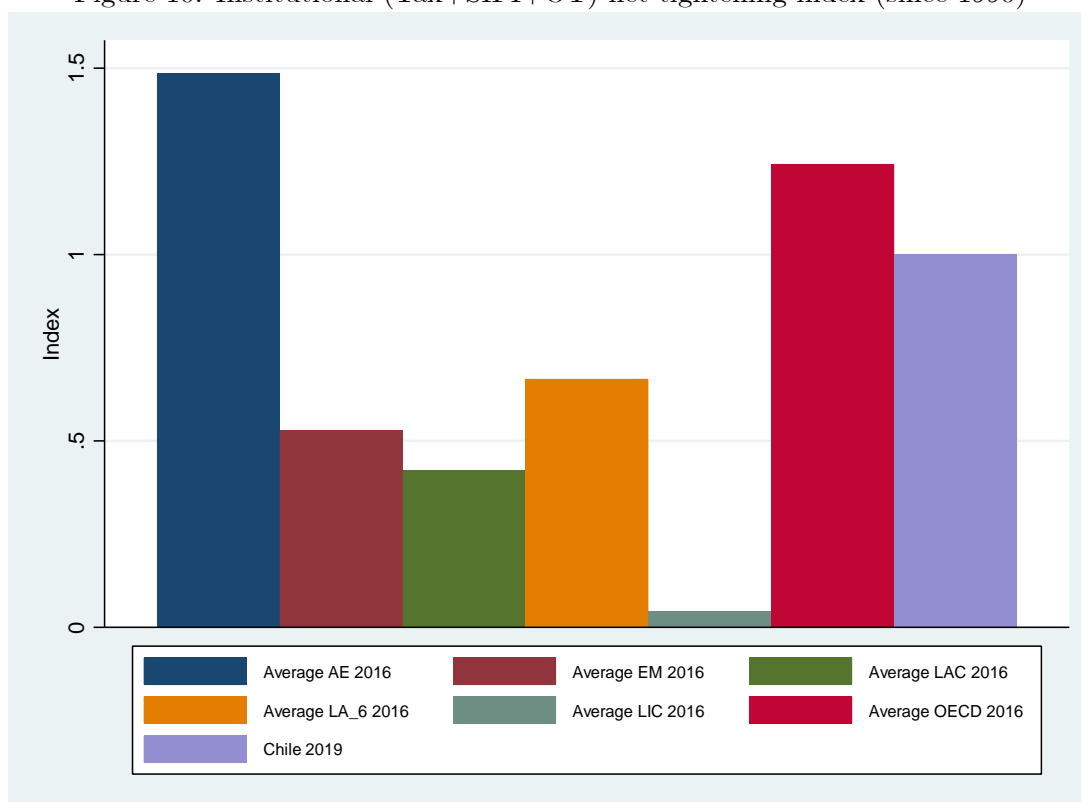
Figure 10: Institutional (Tax+SIFI+OT) net tightening index (since 1990)

because many of the commercial banks in developing economies are foreign banks (Frost and van Stralen 2018) and therefore do not represent a systemic risk for the national banking system.

3 Openness indexes

Figure 11 shows that Chile was a financially closed economy until the mid 1980s and then became very closed again after the banking crisis of 1982 (Berstein and Marcel 2019), one of the largest ones in financial history (Reinhart and Rogoff 2014). Chile only opened again briefly in 1997, before closing again shortly due to the Asian crisis (Berstein and Marcel 2019). Chile, however, became again an economy open to the outside financial flows after 2000. Although with a small reduction in openness between 2008 and 2012 after the Great Financial Crisis, Chile remained a financially open country until the recent years (Berstein and Marcel 2019). This evolution contrasts with the Advanced Economies (AEs) and the OECD, which steadily became more financially open after the

Figure 11: Financial Openness Index (Chinn-Ito 2006), normalized
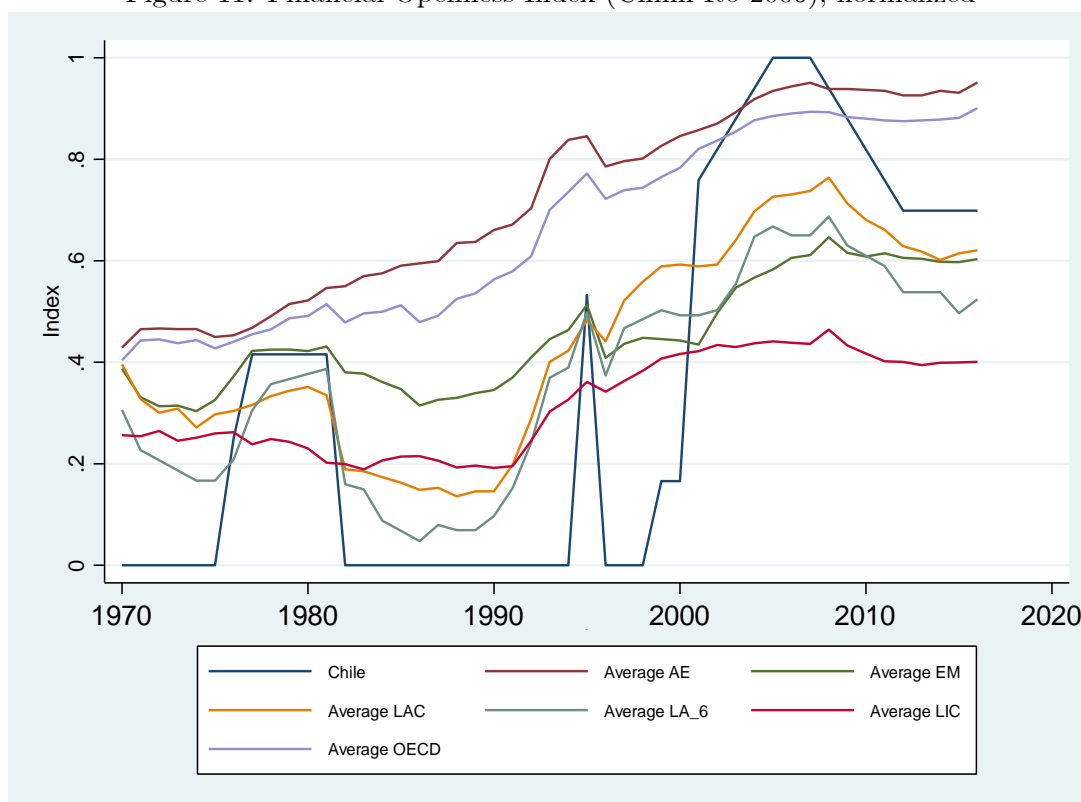
end of Bretton Woods in 1973, with only a small reduction in openness during the Asian crisis of 1997. The Emerging Markets (EMs), Latin America (LAC and LA-6) and Low Income Countries (LICs), however, decreased their financial openness significantly in the early 1980s, which coincided with several financial crises caused by a sudden increase in the USD interest rates (Reinhart and Rogoff 2014). These regions then started a gradual process of re-opening again in the early 1990s, although with a small reduction in financial openness after the Great Financial Crisis of 2008.

Between 2000 and 2015, the Capital Inflows Tightening Policy Index (Pasricha 2017) shows that the average of the Emerging Markets (EMs), Latin American (LA-6) and the OECD became more restrictive in terms of the total (FDI and non-FDI) net capital inflows (Figure 12), the FDI (Foreign Direct Investment) net inflows (Figure 13) and the non-FDI net inflows (Figure 14). Chile, in particular, introduced even more restrictive measures during this period than the average EM, OECD and LA-6 countries, for either total net inflows (Figure 12), FDI net inflows (Figure 13) and non-FDI net inflows (Figure 14). The Low Income Countries (LICs) became substantially less

Figure 12: Capital Inflows Tightening Index (Pasricha 2017): cumulative number of net capital inflows (NKI) restrictive measures
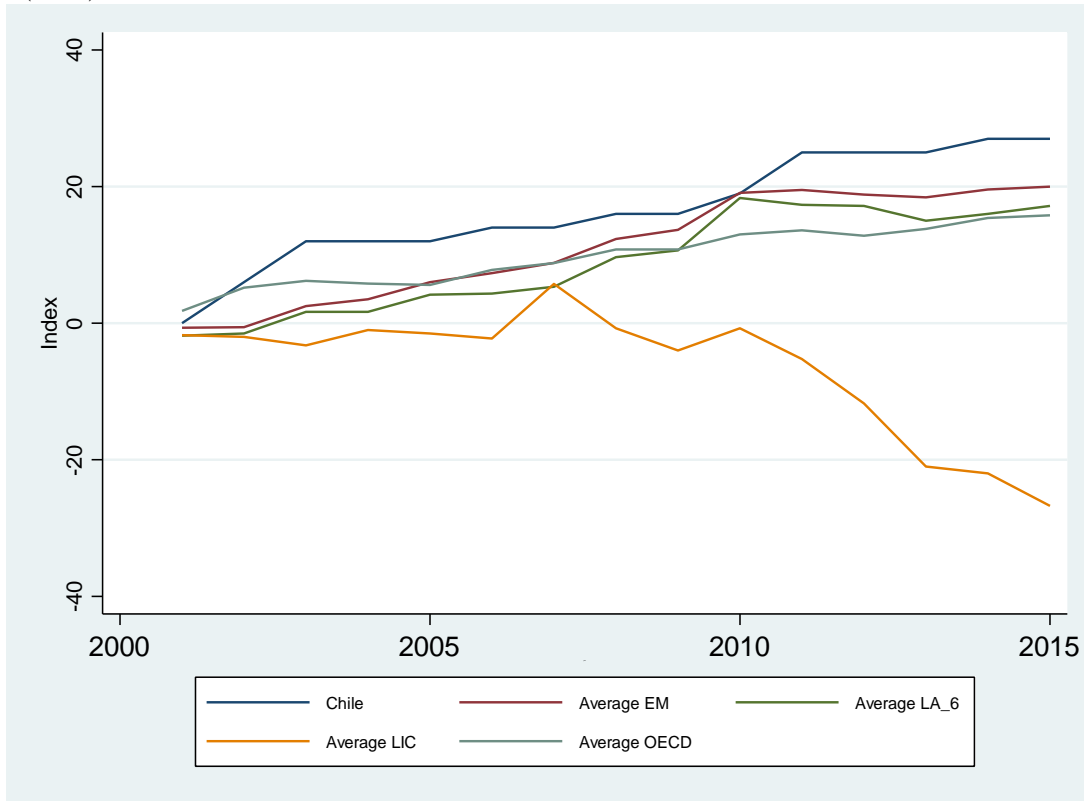
restrictive for the total inflows, FDI and non-FDI inflows, during the same period, perhaps because such countries had started the period with a high level of restrictions to capital inflows[1].

The Capital Flows Index (Fernández et al. 2016) includes more asset classes, it starts in 1995 and it includes more countries relative to Pasricha (2017). Between 1995 and 1999, Chile implemented no change in its capital controls framework which was very restrictive with an index value around 0.90, whether in terms of net flows (Figure 15), inflows (Figure 16) and outflows (Figure 17). Figure 15 shows that Chile then eased substantially its macroprudential flows restrictions between 1999 and 2006, before increasing somewhat is restrictions again between 2008 and 2012 and then

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[1]Note that both the Capital Inflows Tightening Policy Index (Pasricha 2017) and the Capital Controls Index (Fernández et al. 2016) are a sum of dummy indicators and therefore do not take into account the intensity of the policy measures. These measures also do not account the initial differences at the beginning of 2000 and that some countries already started that period with more conservative policies than the others. Therefore it can be misleading to conclude that Chile was more restrictive than the other Latin American countries during this period.

Figure 13: Capital Inflows Tightening Index (Pasricha 2017): cumulative number of Net FDI inflows restrictive measures
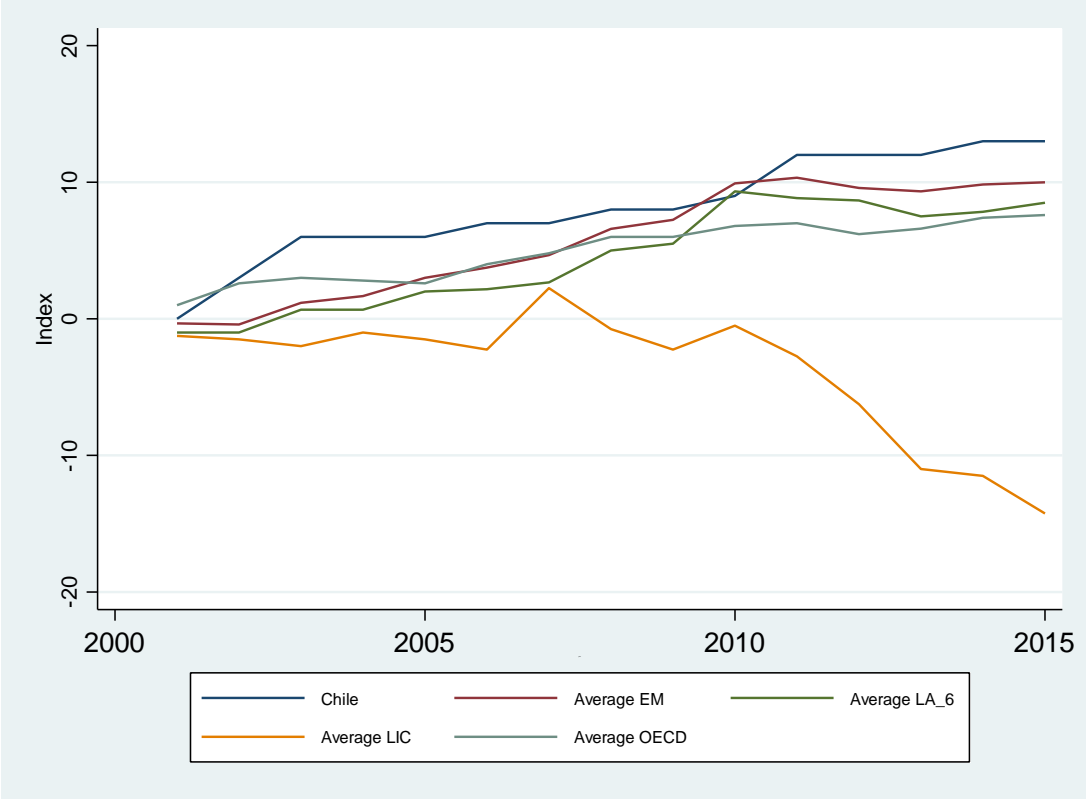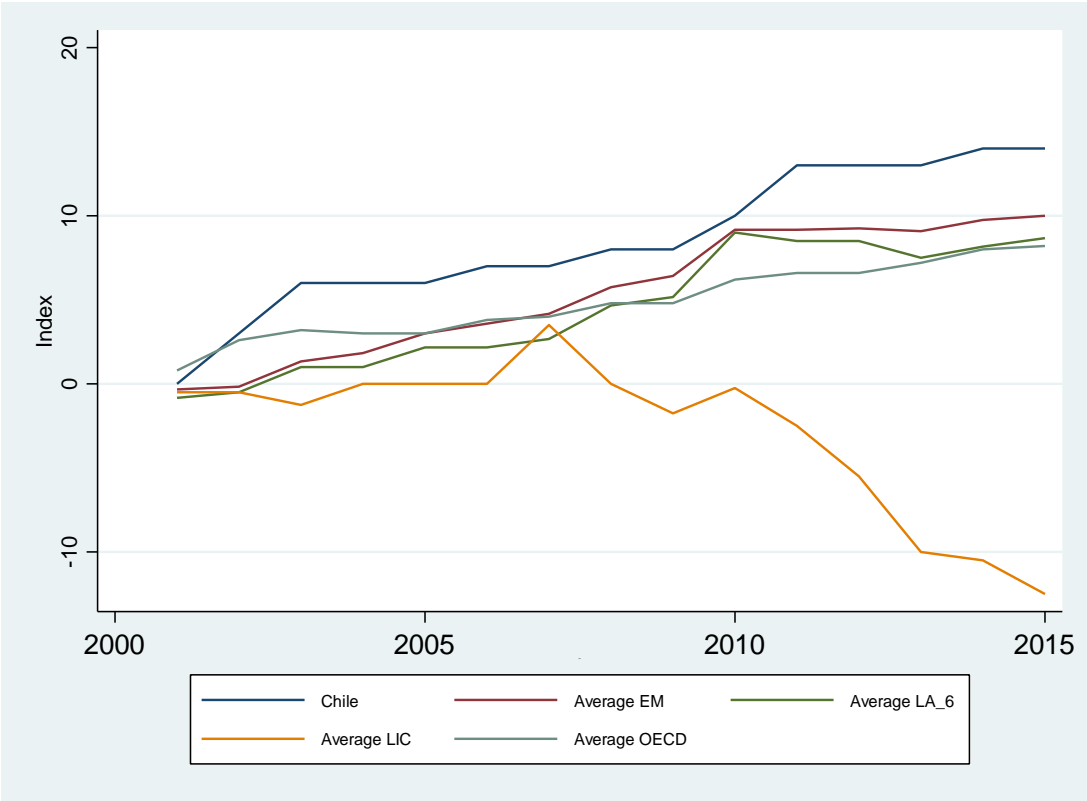
Figure 14: Capital Inflows Tightening Index (Pasricha 2017): cumulative number of non-FDI inflows restrictive measures

stabilizing with an index close to 0.50 until 2016. This tightening of capital flows policies also matches the same results found by the Financial Openness Index (Chinn-Ito 2006). Curiously, the Latin American countries (LAC and LA-6) also became gradually less restrictive between 1995 and 2006, and then increased their restrictions again quickly between 2007 and 2010. Therefore in terms of Capital Flows Macroprudential Restrictions, Chile followed a similar evolution as the other Latin American countries between 1999 and 2010. On the other hand, the average Emerging Market (EMs) and OECD experienced a small reduction in capital flows restrictions between 1995 and 2004, and then made a small and gradual increase in capital flows restrictions until 2016, while the Low Income Countries had a stable index close to 0.60 for the entire period. The results for inflows (Figure 16) and outflows (Figure 17) are very similar to the ones for net flows (Figure 15).

Between 1995 and 2000 Chile was much more restrictive than the other regions (Figure 15), with Chile presenting a Capital Flows Index of 0.90, much higher than the values of 0.60 in the Low Income Countries (LICs), 0.55 in the LA-6, 0.50 in Emerging Markets (EMs), 0.25 in Latin America (LAC) and 0.20 in the OECD. Due to a rapid easing of capital flows policies between 1999 and 2006, Chile was the most open of all the countries for a brief period between 2006 and 2007. The Great Financial Crisis changed this and again the country quickly introduced some capital flows restrictions, stabilizing around a value of 0.50 after 2012. This value of 0.50 after 2012 is very similar to the average of the LA-6 and Emerging Markets (EMs), while being slightly higher than the average of Latin America (LAC) and somewhat lower than the 0.60 value for the 0.20 in the Low Income Countries (LICs). However, Chile is still much more restrictive for capital flows than the average OECD country, which reports a Capital Flows Index for net flows of 0.25.

4   Impact of Regulations on manufacturing growth

4.1   Empirical approach and identification

What is the impact of macroprudential policy on industrial growth? Previous literature has documented, for instance, that some manufactures are more dependent on external finance funds and therefore suffer more during recessions and sudden-stops (Cowan and Raddatz 2013), therefore it is possible that some manufactures are also more susceptive to financing problems when macroprudential

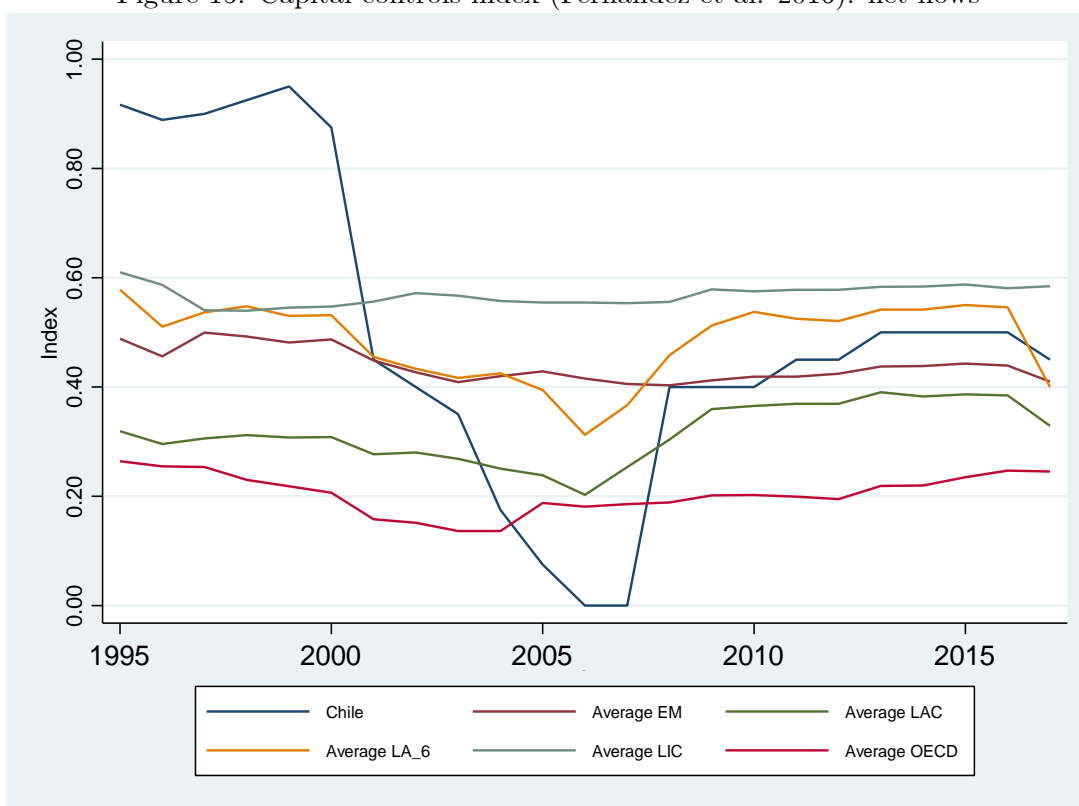Figure 15: Capital controls index (Fernández et al. 2016): net flows

Figure 16: Capital controls index (Fernández et al. 2016): inflows
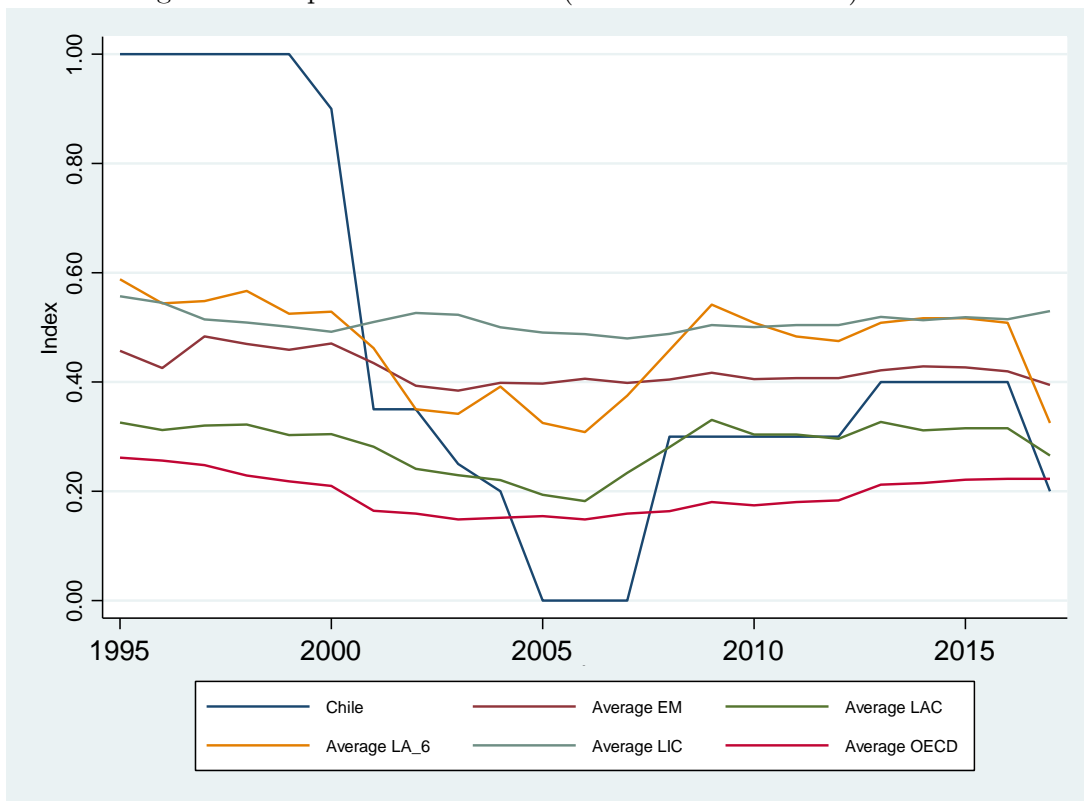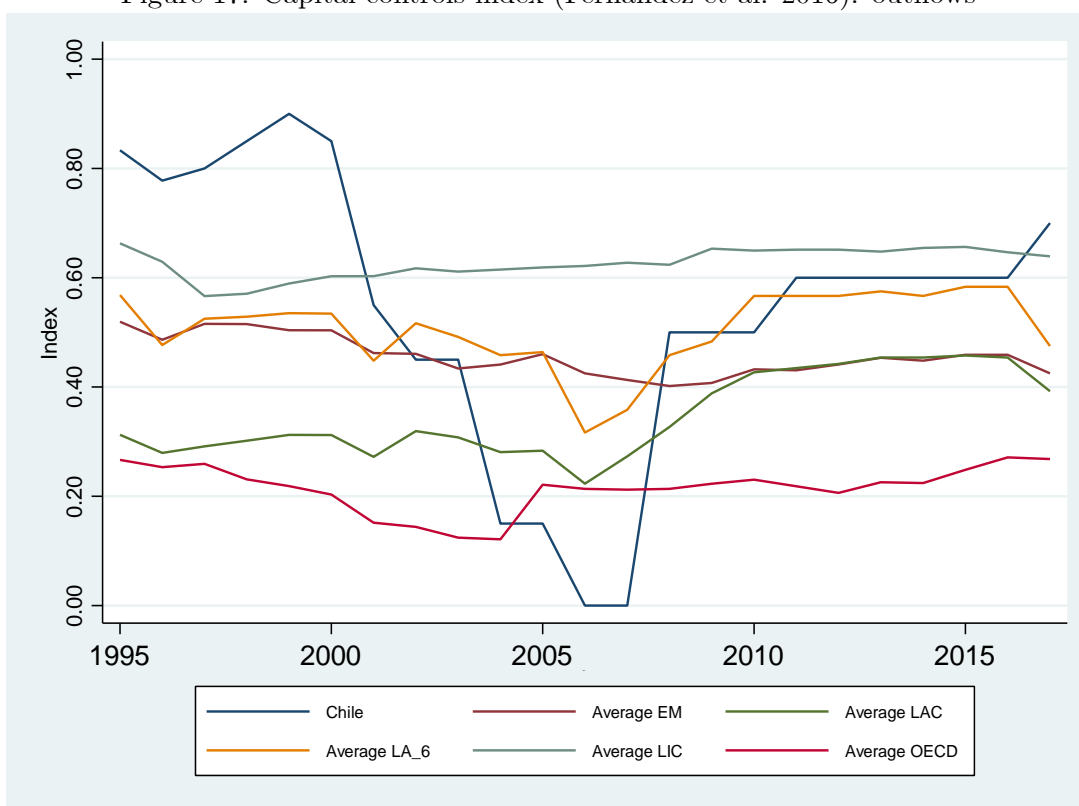
Figure 17: Capital controls index (Fernández et al. 2016): outflows

policies become more restrictive (Madeira 2020). Madeira (2020) uses annual data for the real growth ($g_{i,c,t}$) of 23 manufactures and 93 countries from the UNIDO's Indstat2 and tests whether certain industries suffer a negative economic growth shock with more restrictive macroprudential policies. For this Madeira (2020) estimates two equations modelling the impact of the total macroprudential policy implemented in period t , $TPP_{c,t}$, and the cumulative macroprudential policy restrictions already implemented previously, $CTPP_{c,t-1}$, on the real industrial growth $g_{i,c,t}$ and the real growth volatility $\ln(\hat{V}(g_{i,c,t}))$ of manufacture i from country c at time t.

1) $g_{i,c,t} = (\beta + \gamma EFD_i) \times [TPP_{c,t}, CTPP_{c,t-1}] + \delta x_{i,c,t} + f_{i,c} + f_t + \varepsilon_{i,c,t}$

2) $\ln(\hat{V}(g_{i,c,t})) = (\beta_v + \gamma_v EFD_i)[TPP_{c,t}, CTPP_{c,t-1}] + \delta_v x_{i,c,t} + \tilde{f}_{i,c} + \tilde{f}_t + \tilde{\varepsilon}_{i,c,t}$

with EFD_i being the manufacture's external finance dependence as measured by the Rajan-Zingales index (Rajan-Zingales 1998), $x_{i,c,t}$ denoting a vector of other observable control variables, $f_{i,c}$ being fixed-effects for each industry-country pair and f_t denoting time fixed-effects. These regressions are estimated by an OLS with fixed-effects (OLS-FE). A second alternative is to use the Blundell-Bond GMM (BB-FE) method (Blundell and Bond 1998) if one adds a lagged industrial growth variable $g_{i,c,t-1}$ as a control. Since the BB-FE method is computationally burdensome with too many moment conditions, then I only use the lags $l = 2, 3, 4$ as IV, as suggested by Blundell and Bond 1998. Finally, a third analysis considers that the impact of macroprudential policies can be heterogeneous according to whether industrial growth is high or low. Therefore I also report estimates of a Quantile Regression model with Fixed-Effects, using the quantiles 25, 50, 75, and 90, as measures of how macroprudential policies affect industrial growth from low to higher growth periods. For the QREG-FE estimator I use the method proposed by Machado and Santos-Silva (2019), which is valid under some regularity assumptions imposed on the conditional moments.

The QREG-FE allows to test that the effect of macroprudential policies on growth and its volatility is not just the effect of a few outliers and also gives information on whether macroprudential policies affect highly uncertain periods more than normal periods (Bloom et al. 2018). Note, however, that the analysis of industrial growth volatility can understate the benefits of macroprudential policies on financial and economic stability, since a simple variance measure can miss the impact of large and abrupt financial crises. Such rare disasters can have huge costs on welfare (Barro 2006)

and some empirical evidence shows that banking crises can be particularly large and last longer in developed economies (Laeven and Valencia 2018).

4.2 Estimates

Table 1 shows the baseline results for estimating equation 1). As expected, all the estimated models show that macroprudential policies have a stronger negative impact on the growth of external finance dependent industries, whether in terms of the new policy ($TPP_{c,t} \times EFD_i$) or the cumulative policy stance ($CTPP_{c,t-1} \times EFD_i$). The immediate impact of a new macroprudential policy ($TPP_{c,t}$) in the first two models is shown to be positive. However, this can be explained partially because regulators implement tightening during periods of high growth, since the coefficient is no longer significant and becomes much smaller in size after controlling for contemporaneous real GDP growth ($g_{c,t}^{GDP}$). The $Share_{i,c,t-1}$ is always with slower industrial growth, which is expected: industries that are already a large part of the economy tend to expand less due to fewer growth opportunities. Also, as expected overall GDP growth is associated with higher growth in each industry, while higher inflation is associated with lower growth.

Now Table 2 summarizes the coefficients of the Quantile regressions with fixed-effects, showing again that industries with higher External Finance Dependence are more negatively affected by the cumulative policy stance ($CTPP_{c,t} \times EFD_i$) and that this effect is stronger in periods of higher growth given by the quantiles 75 and 90. The quantile regressions use the percentiles of the industry-country pairs, therefore it is interesting to check whether the same results appear for the country's overall business cycle. Since the dataset is at a yearly frequency, then it is not possible to use standard expansion/recession dates, since the same years could have both an expansion and a recession. Therefore I classify each country's year into periods of low, median and high growth, according to whether the cyclical component of its real GDP growth Hodrick-Prescott residuals (with a smoothing parameter of 6.25 for annual data) is in the bottom 3 deciles, the deciles 4 to 7, and the top 3 growth deciles, respectively[2]. Again, the results for these three country growth

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[2]The real GDP growth to compute these cyclical country growth components for the period 1951 until 2017 is again taken from the Penn-World Tables. Note that, while in the period 1951-2017 the growth stages of low, median and high growth are exactly 30%, 40% and 30%, in the period of 1990-2016 of the regression analysis there is a higher fraction of observations in the median growth stage due to several countries experiencing a Great Moderation stage.

Table 1: Effects on manufacture growth ($Y = g_{i,c,t}$) of the countries' total macroprudential policies ($TPP_{c,t}, CTPP_{c,t-1}$):

Controls	OLS-FE			Blundell-Bond FE	
	(1)	(2)	(3)	(4)	(5)
$TPP_{c,t}$	0.00316***	0.00300***	0.000868	0.00122	0.000609
	(0.000786)	(0.000781)	(0.000761)	(0.00107)	(0.00107)
$CTPP_{c,t-1}$	5.07e-05	-0.000335	-0.000136	-0.00602***	-0.00543***
	(0.000325)	(0.000346)	(0.000350)	(0.000981)	(0.000969)
$TPP_{c,t} \times EFD_i$	-0.00383**	-0.00392**	-0.00345*	-0.00942***	-0.00708***
	(0.00194)	(0.00192)	(0.00182)	(0.00248)	(0.00238)
$CTPP_{c,t-1} \times EFD_i$	-0.00194***	-0.00194***	-0.00197***	-0.00751***	-0.00662***
	(0.000746)	(0.000726)	(0.000705)	(0.00224)	(0.00216)
$Share_{i,c,t-1}$	-0.172***	-0.165***	-0.166***	-0.875***	-0.832***
	(0.0412)	(0.0402)	(0.0402)	(0.148)	(0.144)
$\ln(GDP_{c,t}^{PPP,pc})$		-0.00243	-0.00808	-0.143***	-0.0852***
		(0.00895)	(0.00951)	(0.0240)	(0.0228)
GDO growth: $g_{c,t}^{GDP}$			1.111***		
			(0.0464)		
$g_{c,t-1}^{GDP}$		0.309***	-0.118***	0.179***	0.116**
		(0.0360)	(0.0371)	(0.0494)	(0.0495)
GDP inflation: $inf_{c,t}^{GDP}$		-0.0462***	-0.0340***	-0.103***	-0.0817***
		(0.00723)	(0.00704)	(0.0139)	(0.0137)
$g_{i,c,t-1}$				-0.150***	-0.153***
				(0.0119)	(0.0121)
$(Credit/GDP)_{c,t}$					-0.000610***
					(0.000137)
N	35,401	35,401	34,701	33,660	32,595
R-2 (within)	0.101	0.112	0.161		
Nr of id	1,730	1,730	1,730	1,730	1,730

Other controls: fixed effects for industry-country and year.

Robust standard-errors in (). ***,**,* denote 1%, 5%, 10% statistical significance.

Table 2: Effects on manufacture growth ($Y = g_{i,c,t}$) of the countries' overall macroprudential policies ($TPP_{c,t}, CTPP_{c,t-1}$)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		QREG-FE			OLS-FE at different growth stages		
Controls	Q 25	Q 50	Q 75	Q 90	Low growth	Median growth	High growth
$TPP_{c,t}$	0.00392*	0.00297**	0.00207	0.00121	0.00793***	0.00136	0.00132
	(0.00226)	(0.00151)	(0.00160)	(0.00237)	(0.00206)	(0.00103)	(0.00211)
$CTPP_{c,t-1}$	-0.000587	-0.000327	-7.80e-05	0.000158	-0.00225***	0.000310	0.000965
	(0.000830)	(0.000554)	(0.000590)	(0.000870)	(0.000857)	(0.000419)	(0.000857)
$TPP_{c,t} \times EFD_i$	-0.00185	-0.00106	-0.000295	0.000427	-0.0175***	0.00110	0.00119
	(0.00542)	(0.00361)	(0.00385)	(0.00568)	(0.00459)	(0.00239)	(0.00535)
$CTPP_{c,t-1} \times EFD_i$	-0.000912	-0.00197*	-0.00299**	-0.00395**	-0.00105	-0.00372***	-0.00474**
	(0.00172)	(0.00115)	(0.00122)	(0.00180)	(0.00228)	(0.000893)	(0.00222)
$Share_{i,c,t-1}$	-0.146	-0.166***	-0.185***	-0.204**	-0.192***	-0.0944**	-0.188***
	(0.0890)	(0.0594)	(0.0633)	(0.0933)	(0.0680)	(0.0418)	(0.0695)
$\ln(GDP_{c,t}^{PPP,pc})$	0.0351	-0.00358	-0.0407**	-0.0758***	0.00810	-0.0460***	-0.0143
	(0.0237)	(0.0158)	(0.0169)	(0.0249)	(0.0175)	(0.0117)	(0.0157)
$g_{c,t-1}^{GDP}$	0.419***	0.306***	0.198***	0.0959	0.498***	0.295***	0.113**
	(0.0886)	(0.0591)	(0.0630)	(0.0929)	(0.0684)	(0.0506)	(0.0557)
$inf_{c,t}^{GDP}$	-0.0683***	-0.0455***	-0.0236	-0.00289	-0.0207*	-0.0941***	-0.0241***
	(0.0208)	(0.0139)	(0.0148)	(0.0218)	(0.0110)	(0.0109)	(0.00699)
N		35,401			9,135	17,338	8,840

Other controls: fixed effects for industry-country and year.
Robust standard-errors in (). ***,**,* denote 1%, 5%, 10% statistical significance.

stages show that the impact of the cumulative stance of the macroprudential policies on industrial growth is felt more strongly during the periods of median and high growth, particularly for the industries with high external finance dependence ($CTPP_{c,t-1} \times EFD_i$).

The quantile regression and growth stage results are consistent with some results of the previous literature. Cerutti et al. (2017) show that macroprudential policies have a stronger effect on real credit growth during periods of high growth. Alam et al. (2019) also show that macroprudential policies have a more negative impact on household credit, house price growth and real GDP growth during periods of high growth, but only in the Advanced Economies (AEs). Bruno et al. (2017) show that macroprudential policy tightenings are more effective when these coincide with monetary policy tightenings, which usually happen during economic expansions. Again, lagged real GDP growth is associated with higher industrial growth, while larger industries relative to the whole economy ($Share_{i,c,t-1}$) and inflation are associated with lower industry growth.

Finally, Table 3 reports the estimates for the growth volatility models. All the models (OLS-FE,

Table 3: Effects on manufacture growth volatility ($\ln(\hat{V}(g_{i,c,t}) = \ln((g_{i,c,t} - \hat{g}_{i,c,t})^2)$ of the overall macroprudential ($TPP_{c,t}, CTPP_{c,t}$): OLS-FE, Blundell-Bond FE, QREG-FE

Controls	(1)	(2)	(3)	(4)	(5)	(6)
					QREG-FE	
	OLS-FE		BB-FE	Q25	Q50	Q75
$TPP_{c,t}$	-0.0346**		-0.0373***	-0.0445**	-0.0311**	-0.0214
	(0.0146)		(0.0102)	(0.0211)	(0.0135)	(0.0156)
$CTPP_{c,t-1}$	0.00157	-0.0130*	0.0138	0.000745	0.00186	0.00267
	(0.00695)	(0.00726)	(0.0137)	(0.00850)	(0.00545)	(0.00630)
$EFD_i \times TPP_{c,t}$	0.0577*		0.0107	0.0759*	0.0512*	0.0334
	(0.0299)		(0.0297)	(0.0433)	(0.0278)	(0.0321)
$EFD_i \times CTPP_{c,t-1}$	-0.0330**	-0.0263**	-0.0350	-0.0326**	-0.0331***	-0.0334***
	(0.0128)	(0.0131)	(0.0281)	(0.0156)	(0.0100)	(0.0116)
$Variance_{i,t-1}$			-0.136***			
			(0.00757)			
$Share_{i,c,t-1}$	-0.0542	-0.126	4.177***	0.634	-0.298	-0.970*
	(0.630)	(0.609)	(1.314)	(0.730)	(0.468)	(0.541)
$\ln(GDP_{c,t}^{PPP,pc})$	-0.960***	-0.939***	-2.025***	-0.997***	-0.947***	-0.911***
	(0.136)	(0.137)	(0.305)	(0.166)	(0.106)	(0.123)
$g_{c,t-1}^{GDP}$	-2.309***	-2.369***	-0.153	-2.248***	-2.331***	-2.390***
	(0.417)	(0.412)	(0.483)	(0.574)	(0.368)	(0.425)
$inf_{c,t}^{GDP}$	0.602***	0.584***	0.431**	0.614***	0.598***	0.587***
	(0.0744)	(0.0738)	(0.214)	(0.102)	(0.0651)	(0.0753)
N / Nr of id			35,396 / 1,725			
R-2 (within)	0.031	0.030				

Other controls: fixed effects for industry-country and year.
Robust standard-errors in (). ***,**,* denote 1%, 5%, 10% statistical significance.

BB-FE, QREG-FE) show that macroprudential policies moderate the growth volatility of industries with higher external finance dependence ($EFD_i \times CTPP_{c,t}$). The newly introduced macroprudential policies ($TPP_{c,t}$) also seem to reduce the industrial growth volatility (although only for industries with low external finance dependence, since $EFD_i \times TPP_{c,t}$ is positive), especially in periods of median (quantile 50) and low volatility (quantile 25). Overall, the estimated models provide some evidence that macroprudential policies help to moderate volatility, therefore policy-makers may face a difficult trade-off between higher growth and lower volatility. This evidence is consistent with studies showing that countries with occasional financial crises experience higher growth (Rancière, Tornell and Westermann 2008). It is also a similar policy trade-off as the one found in the case of monetary policies leaning against financial instability (Gourio, Kashyap and Sim 2018).

In summary, the results show that macroprudential policies have a negative impact on industrial

growth, especially in industries that are more dependent on external funds. This effect is both statistically significant and economically relevant. The OLS-FE regressions show that macroprudential policies have a small and insignificant effect on the industrial growth of industries with no external finance dependence, which makes sense since those industries can resort to internal funds generated from operational revenues. But for industries with a high external finance dependence, then the OLS-FE estimated coefficients show that on average each macroprudential policy measure has a negative effect of -0.6% in terms of log growth in the short-term (the sum of the coefficients of $TPP_{c,t} \times EFD_i$ and $CTPP_{c,t-1} \times EFD_i$) and -0.4% ($CTPP_{c,t-1} \times EFD_i$) in the long-term. With the BB-FE instrumental variables approach, the results have even more impact on the industries with high external finance dependence. For the industries with low external finance dependence the short-term impact of each additional macroprudential policy on industrial growth is again small (with the sum of $TPP_{c,t}$ and $CTPP_{c,t}$ being 0.1%). However, even for industries with zero external finance dependence the IV estimates an impact of -0.6% ($CTPP_{c,t-1}$) in terms of log-growth in the long-term. For industries that are high on external finance dependence then the short-term impact of an additional macroprudential policy on industrial growth is -1.1% (the sum of the coefficients $TPP_{c,t}$, $CTPP_{c,t-1}$, $TPP_{c,t} \times EFD_i$, $CTPP_{c,t-1} \times EFD_i$), while its long-run effect is -1.3% (the sum of the coefficients $CTPP_{c,t-1}$ and $CTPP_{c,t-1} \times EFD_i$).

5   Policy implications

The estimates in the previous sections are heterogeneous across industries due to the level of external finance dependence (EFD_i). Therefore it is is hard to visualize the total impact of macroprudential policies in a given country, especially as countries differ substantially in their industrial composition, with advanced economies being more specialized in industries with high external finance dependence (Madeira 2020). This section summarizes the policy implications by showing a simple estimate of the impact on industrial growth of a large regulatory change such as the Basel III standards.

The Basel III standards imply a complex package of new regulatory measures (BIS 2019): i) an increase in Capital Requirements in terms of Tier I capital, ii) a Conservation buffer, iii) an unweighted Leverage ratio (LVR), iv) a Liquidity Coverage Ratio (LCR), v) Net Stable Funding Ratio (NSFR), vi) a Countercyclical capital buffer (CCB), vii) higher loss absorbency requirements

for Systemically important banks (SIBs or SIFIs), whether global (G-SIBs) or domestic (D-SIBs), viii) Stress testing, limits on exposures and disclosure requirements (Pillars 2 and 3). However, it is possible that several countries were already adopting many of the measures of Basel III before, such as stress testing, limits on exposure and disclosure requirements, while measures such as the additional Countercyclical capital (CCB) or SIFI measures may be legally adopted but without a practical implementation for the foreseeable future. Therefore for most countries the adoption of Basel III is best understood as requiring 5 additional macroprudential policies, which correspond to the first five regulations in the previous list (measures i to v).

For simplicity, I focus only on a long-term measure of impact of the macroprudential policies which uses only the cumulative policy stance ($CTTP$) coefficients and therefore ignore the additional short-term impact of the new policy measures (TPP) which has an effect only for one year. The measure of the macroprudential impact on each country's manufacturing growth is therefore given as the sum of the impact of each industry weighted by its value-added: $impact_{c,t} = 5 \times (\beta_{CTPP} + \sum_{i=1}^{I} \gamma_{CTPP} \times EFD_i \times Share_{i,c,t-1})^3$. Although the selected models do not have heterogeneous coefficients across countries, the results differ for each country due to the external finance dependence of its industries.

The OLS-FE estimates in Table 4 show that the negative impact on industrial growth of a policy mix such as the adoption of the Basel III standards could be between -0.19% (for the least affected countries, as represented by the percentile 90th of the country distribution) to as high as -0.50% (as represented by the 10th percentile of the country distribution). Furthermore, Table 4 shows that the effects of adopting the Basel III standards are higher for the manufacturing sector of Advanced economies. In particular, Table 4 shows that in Advanced economies the impact on industrial growth ranges from as low as -0.30% to -0.45 and -0.57% for the least affected (percentile 90th), the median and the most affected countries (percentile 10th). In the case of Emerging markets' countries, the impact on industrial growth would be -0.22%, –0.33% and -0.49% for the least affected (percentile 90th), the median and the most affected countries (percentile 10th), respectively. Finally, the Low income countries receive the smallest reduction on growth, with an effect of -0.16%, -0.23% and -0.36% for the least affect, the median and the most affected countries.

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[3] For the special case of the BB-FE model, the estimate must be adjusted by the dynamic factor of the AR term $g_{i,c,t-1}$: $impact_{c,t} = \frac{1}{1-\delta_{g_{i,c,t-1}}} 5 \times (\beta_{CTPP} + \sum_{i=1}^{I} \gamma_{CTPP} \times EFD_i \times Share_{i,c,t-1})$.

Table 4: Estimated impact (in percentage points) of 5 additional macroprudential policies on the countries long-term manufacturing growth and its log-volatility for the year 2016

$$(impact_{c,t} = 5 \times (\beta_{CTPP} + \sum_{i=1}^{I} \gamma_{CTPP} \times EFD_i \times Share_{i,c,t-1}))$$

Dependent variable	Industrial growth					ln(growth-volatility)
Regression type	OLS-FE	Q25-FE	Q50-FE	Q75-FE	Q90-FE	OLS-FE
All countries (percentiles) - 93 countries						
P10	-0.50	-0.55	-0.64	-0.73	-0.81	-5.73
P25	-0.42	-0.50	-0.55	-0.60	-0.65	-4.46
P50	-0.33	-0.45	-0.46	-0.47	-0.48	-3.07
P75	-0.26	-0.41	-0.38	-0.36	-0.33	-1.91
P90	-0.19	-0.37	-0.31	-0.26	-0.20	-0.89
Advanced economies (percentiles) - 34 countries						
P10	-0.57	-0.59	-0.72	-0.84	-0.96	-6.94
P25	-0.49	-0.54	-0.63	-0.71	-0.79	-5.57
P50	-0.45	-0.52	-0.58	-0.65	-0.71	-4.91
P75	-0.37	-0.47	-0.50	-0.53	-0.56	-3.73
P90	-0.30	-0.43	-0.42	-0.41	-0.41	-2.52
Emerging markets (percentiles) - 29 countries						
P10	-0.49	-0.54	-0.63	-0.72	-0.80	-5.67
P25	-0.38	-0.48	-0.51	-0.54	-0.57	-3.79
P50	-0.33	-0.45	-0.46	-0.47	-0.48	-3.06
P75	-0.29	-0.42	-0.41	-0.40	-0.39	-2.36
P90	-0.22	-0.39	-0.34	-0.30	-0.26	-1.36
Low income countries (percentiles) - 30 countries						
P10	-0.36	-0.47	-0.49	-0.52	-0.54	-3.59
P25	-0.30	-0.43	-0.43	-0.42	-0.42	-2.59
P50	-0.23	-0.39	-0.35	-0.31	-0.27	-1.42
P75	-0.18	-0.36	-0.30	-0.23	-0.17	-0.65
P90	-0.16	-0.35	-0.28	-0.21	-0.14	-0.38

As mentioned before, these estimates are valid only for the manufacturing sector, which represents only 11% of the GDP for the median country (see Table 1). However, if one takes the manufacturing sector as representative of the wider economy, then it is worth mentioning that these estimates are substantially larger than the reduction in annual GDP growth of -0.05% to 0.15% estimated for the OECD countries in previous studies (Slovik and Cournède 2011).

The Quantile regressions with fixed-effects show an even stronger impact of the macroprudential policies. For the least-affected countries (percentile 90th), the quantile regressions show an impact of -0.37% during periods of low growth (as given by the quantile 25), -0.31% during periods of median growth (as given by the quantile 50) and -0.20% during periods of high growth (as given by the quantile 90). For the median country (percentile 50th), the quantile regressions show an effect of -0.45% to -0.48%, independently of whether there is low, median or high growth. For the most affected countries, however, the quantile regressions show estimates of -0.55%, -0.64 and -0.81% during periods of low, median and high growth (as given by the quantiles 25, 50 and 90). Again, the Quantile regressions also confirm that the Advanced economies are substantially more affected by a large macroprudential reform than the Emerging markets and that the Emerging markets in turn are more affected than the Low income countries.

Finally, the estimates show that there can be substantial benefits from a large macroprudential reform as well, especially in Advanced economies. The volatility of industrial growth after a BIS reform falls between -0.9% to -3.1% and -5.7%, for the countries least affected (percentile 90th), the median and the most affected countries (percentile 10th), while in Advanced economies such impact would be -2.5%, -4.9% and -6.9%. For Emerging Markets and Low income countries the median country impact would be -3.% and -1.4%, respectively.

6   Conclusions

Based on the iMaPP-IMF dataset (Alam et al. 2019), this study compares the use of financial regulations in Chile versus other countries. We find that in 2019 Chile makes an overall use of macroprudential policies as the Advanced Economies (AEs) and OECD countries, although its policies are less restrictive than the other Emerging Markets (EMs), Latin American countries (LAC and LA-6). However, Chile's updating of its prudential framework lagged the Advanced Economies

(AEs) and OECD, which started tightening its financial regulations since 2009. In particular, Chile became similar to the Advanced Economies (AEs) and OECD countries in its Institutional macroprudential policies such as SIFI capital surcharges, while other Emerging Markets (EMs) and Latin American countries (LAC and LA-6) make less use of such regulations. In Chile, the new General Banking Law (January of 2019) implemented 5 policy tightenings, which updated the Chilean regulatory framework towards the Basel III standards: Capital requirements, Conservation buffer, Liquidity requirements, Systemically Important Financial Institutions (SIFI) capital surcharges, unweighted Leverage Ratio.

Chile implemented a smaller tightening of loan supply and loan demand restrictive policies, except for the mortgage Loan-to-Value regulation, which was increased to 100% in 2009. The mortgage Loan-to-Value is a regulation quite restrictive in Chile and Latin America (LAC and LA-6), although it became less restrictive across other Emerging Markets (EMs), Advanced Economies (AEs) and OECD countries. Chile is similar to Emerging Markets (EMs) and Latin America (LAC and LA-6) in terms of supply of capital and general supply macroprudential restrictions, but it is more restrictive in such policies than the Advanced Economies (AEs) and OECD.

In terms of Financial Openness (Chinn and Ito 2006) and Capital Flows restrictions (Fernández et al. 2016), we show that Chile became quite closed after the Banking crisis of 1982, but quickly opened its financial system to outside flows after 1999. However, Chile - like the rest of Latin America (LAC and LA-6) - reduced its financial openness and tightened some of its capital flows policies between 2008 and 2012. The Advanced Economies (AEs), OECD and Emerging Markets (EMs) have kept an increasing trend in financial openness for the whole period, a process which started in the 1970s after the end of Bretton Woods.

Finally, using the UNIDO's annual dataset on the real growth of 23 manufacture industries across 93 countries, we find that industries with high external finance dependence suffer from periods with high macroprudential tightness. However, macroprudential policies also reduce the volatility of manufacturing growth. A large financial reform such as the new Banking Law introduced in Chile in 2019 can reduce the real manufacturing growth of the median Emerging Market (like Chile) by 0.46%, but it also reduces the volatility of its growth by 3.06%. Therefore there is a strong trade-off between average growth and volatility when considering the effects of macroprudential regulations. Note, however, that this evidence is restricted to the manufacturing sector, which represents just

11.1% of the total GDP for the median country. Since we have no available evidence on the effect of macroprudential policies on large economic sectors in Chile such as Mining or Services, then we cannot provide an overall estimate for the total impact of the macroprudential policies for the GDP in Chile or in other economies. There is therefore significant room for more research on the topic of financial regulation and growth (Madeira 2020).

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7   Appendix: List of countries in each region

7.1   iMaPP dummy indicators data (135 countries)

OECD - Australia, Austria, Belgium, Canada, Chile, Colombia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.

Advanced Economies (AEs) - Australia, Austria, Belgium, Canada, Curacao, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Taiwan, United Kingdom, United States.

Emerging Markets (EMs, excluding Low Income Countries) - Algeria, Argentina, Azerbaijan, Bahamas, Bahrain, Belarus, Benin, Bhutan, Botswana, Brazil, Brunei Darussalam, Bulgaria, Chile, China, Colombia, Congo Democratic Republic, Costa Rica, Croatia, Dominican Republic, Guinea Bissau, Hungary, Kazakhstan, Kosovo, Kuwait, Kyrgyz Republic, Lebanon, Macedonia, Malaysia, Mali, Mauritania, Mauritius, Mexico, Montenegro, Oman, Peru, Poland, Romania, Russia, Saint

Kitts And Nevis, Saudi Arabia, Serbia, Solomon Islands, South Africa, Sudan, Thailand, Timor Leste, Togo, Trinidad and Tobago, Turkey, United Arab Emirates, Uruguay.

Low Income Countries (LICs, countries with less than 10,000 USD of GDPpc-PPP in 2010) - Albania, Angola, Armenia, Bangladesh, Bosnia and Herzegovina, Burkina Faso, Burundi, Cambodia, Cape Verde, Côte d'Ivoire, Ecuador, El Salvador, Ethiopia, Fiji, Gambia, Georgia, Ghana, Haiti, Honduras, India, Indonesia, Jamaica, Jordan, Kenya, Laos, Lesotho, Moldova, Mongolia, Morocco, Mozambique, Nepal, Niger, Nigeria, Pakistan, Paraguay, Philippines, Senegal, Sri Lanka, Tajikistan, Tanzania, Tonga, Tunisia, Uganda, Ukraine, Vietnam, Yemen, Zambia.

Latin America and the Caribbean (LAC) - Argentina, Bahamas, Brazil, Chile, Colombia, Costa Rica, Curacao, Dominican Republic, Ecuador, El Salvador, Haiti, Honduras, Jamaica, Mexico, Paraguay, Peru, Saint Kitts And Nevis, Trinidad and Tobago, Uruguay.

LA-6 (the six largest Latin American countries by population) - Argentina, Brasil, Chile, Colombia, Mexico, Peru.

7.2 iMaPP mean LTV data (66 countries)

OECD - Australia, Austria, Belgium, Canada, Chile, Colombia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.

Advanced Economies (AEs) - Australia, Austria, Belgium, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Taiwan, United Kingdom, United States.

Emerging Markets (EMs, excluding Low Income Countries) - Argentina, Brazil, Bulgaria, Chile, China, Colombia, Croatia, Hungary, Kuwait, Lebanon, Malaysia, Mexico, Peru, Poland, Romania, Russia, Saudi Arabia, Serbia, South Africa, Thailand, Turkey, United Arab Emirates, Uruguay.

Low Income Countries (LICs, countries with less than 10,000 USD of GDPpc-PPP in 2010) - India, Indonesia, Mongolia, Nigeria, Philippines, Ukraine, Vietnam.

Latin America and the Caribbean (LAC) - Argentina, Brazil, Chile, Colombia, Mexico, Peru, Uruguay.

LA-6 (the six largest Latin American countries by population) - Argentina, Brazil, Chile, Colombia, Mexico, Peru.

7.3   Chinn and Ito 2006 data (182 countries)

OECD - Australia, Austria, Belgium, Canada, Chile, Colombia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.

Advanced Economies (AEs) - Australia, Austria, Belgium, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, China, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Malta, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom, United States.

Emerging Markets (EMs, excluding Low Income Countries) - Algeria, Argentina, Azerbaijan, Bahamas, Bahrain, Belarus, Botswana, Brazil, Bulgaria, Chile, China, Colombia, Costa Rica, Croatia, Dominican Republic, Hungary, Kazakhstan, Lebanon, Macedonia, Malaysia, Mauritius, Mexico, Oman, Peru, Poland, Romania, Russian Federation, Saudi Arabia, South Africa, Thailand, Trinidad and Tobago, Turkey, United Arab Emirates, Uruguay.

Low Income Countries (LICs, countries with less than 10,000 USD of GDPpc-PPP in 2010) - Albania, Angola, Armenia, Bangladesh, Bosnia and Herzegovina, Burkina Faso, Burundi, Côte d'Ivoire, Cambodia, Cape Verde, Ecuador, El Salvador, Ethiopia, Fiji, Gambia, Georgia, Ghana, Haiti, Honduras, India, Indonesia, Jamaica, Jordan, Kenya, Laos, Lesotho, Moldova, Mongolia, Morocco, Mozambique, Nepal, Niger, Nigeria, Pakistan, Paraguay, Philippines, Senegal, Sri Lanka, Tajikistan, Tanzania, Tonga, Tunisia, Uganda, Ukraine, Vietnam, Yemen, Zambia.

Latin America and the Caribbean (LAC) - Argentina, Bahamas, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Haiti, Honduras, Jamaica, Mexico, Paraguay, Peru, Trinidad and Tobago, Uruguay.

LA-6 (the six largest Latin American countries by population) - Argentina, Brazil, Chile, Colombia, Mexico, Peru.

7.4   Pasricha 2007 data (18 countries)

OECD - Chile, Colombia, Korea, Mexico, Turkey.

Emerging Markets (EMs, excluding Low Income Countries) - Argentina, Brazil, Chile, China, Colombia, Malaysia, Mexico, Peru, Russian Federation, South Africa, Thailand, Turkey.

Low Income Countries (LICs, countries with less than 10,000 USD of GDPpc-PPP in 2010) - Egypt, India, Indonesia, Morocco, Philippines.

Latin America and the Caribbean (LAC) - Argentina, Brazil, Chile, Colombia, Mexico, Peru.

LA-6 (the six largest Latin American countries by population) - Argentina, Brazil, Chile, Colombia, Mexico, Peru.

7.5   Fernández et al. 2016 data (100 countries)

OECD - Australia, Austria, Belgium, Canada, Chile, Colombia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.

Advanced Economies (AEs) - Australia, Austria, Belgium, Canada, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Malta, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovenia, Spain, Sweden, Switzerland, United Kingdom, United States.

Emerging Markets (EMs, excluding Low Income Countries) - Algeria, Argentina, Bahrain, Brazil, Brunei Darussalam, Bulgaria, Chile, China, Colombia, Costa Rica, Dominican Republic, Hungary, Kazakhstan, Lebanon, Malaysia, Mauritius, Mexico, Oman, Peru, Poland, Romania, Russia, Saudi Arabia, South Africa, Thailand, Turkey, United Arab Emirates, Uruguay.

Low Income Countries (LICs, countries with less than 10,000 USD of GDPpc-PPP in 2010) - Angola, Bangladesh, Burkina Faso, Côte d'Ivoire, Ecuador, El Salvador, Ethiopia, Georgia, Ghana, India, Indonesia, Jamaica, Kenya, Moldova, Morocco, Nigeria, Pakistan, Paraguay, Philippines, Sri Lanka, Tanzania, Tunisia, Uganda, Ukraine, Vietnam, Yemen, Zambia.

Latin America and the Caribbean (LAC) - Argentina, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Jamaica, Mexico, Paraguay, Peru, Uruguay.

LA-6 (the six largest Latin American countries by population) - Argentina, Brazil, Chile, Colombia, Mexico, Peru.