The Effect of Household Debt Deleveraging on Unemployment – Evidence from Spanish Provinces

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ABSTRACT

The Spanish economy is currently plagued by a deep recession with very high unemployment. We ask how much of the unemployment increase in Spain can be traced back to the debt deleveraging needs of Spanish households. We use provincial household debt and sectoral unemployment data and follow Mian and Sufi (2012) to isolate the effect of household debt on Spanish unemployment. We find that the level of household sector debt in Spanish provinces in 2007 is a highly significant determinant of the subsequent increase in provincial unemployment from 2007 to 2010. Our estimates indicate that approximately 1/3 of the increase in overall Spanish unemployment over that period can be traced back to high household debt levels.

JEL Classification: E21, J2, O52

Keywords: debt; leverage; balance sheet recession; household sector; aggregate demand; unemployment

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1 INTRODUCTION

Spanish unemployment has risen from a low of 7% in 2007 to its height of 26% in 2012. Around 6.1 mil. people are currently unemployed in Spain. Unemployment rates are particularly high for young people with every second young Spaniard looking for a job. Given the enormous economic, psychological and social problems that are related with high and long-lasting unemployment, it is of the utmost importance to study the causes of the high increase in Spanish unemployment.

In this paper we therefore take a close look at one of these causes and study the extent to which the increase in Spanish unemployment is due to the effects of Spanish household debt deleveraging. Using household mortgage debt data for 50 Spanish provinces together with detailed data on sectoral provincial unemployment data we estimate that over the period 2007-10 around 1/3 of the newly unemployed, or a total of approximately 860,000 people, have become unemployed due to mortgage debt-related aggregate demand reasons.

The underlying transmission mechanism investigated in this study begins with a deleveraging shock to the balance sheets of individual households. The shock for households is greater if they must direct more effort to restructure their balance sheets. The more debt a household has accumulated relative to its income before the shock occurred, the more deleveraging the household must arrange by increasing savings and reducing spending after the shock to restructure its balance sheet. Given the elasticity of employment with respect to demand, these deleveraging needs will increase unemployment.

This paper contributes to the academic and public debate regarding the relationship between household debt, aggregate demand and its effect on unemployment by studying Spanish

provincial household debt and sectoral employment data. Following Mian and Sufi (2012) we take advantage of the fact that changes in *non-tradable* employment is driven by local demand which in turn depends largely on changes in local households' financial situations. Spanish households' financial situations are currently mainly determined by their deleveraging needs. Thus, by calculating the decreased employment, or similarly the increased unemployment, in the non-tradable sectors of Spanish provinces and regressing those changes on pronvincial household mortgage debt levels in 2007, we can identify the increase in unemployment that is solely related to household debt-driven aggregate demand shocks. After having identified this effect we can then use it to estimate how much of the aggregate decrease in employment, or else aggregate increase in unemployment is due to this debt-driven aggregte demand shock.

The remainder of the paper is structured as follows. Section 2 provides an overview of the related literature. Section 3 describes the theoretical framework. Section 4 presents the empirical evidence for Spanish provinces. We provide evidence for the household debt-driven aggregate demand effect, together with some robustness checks, and then present our estimation of the total increase in Spanish unemployement due to debt-related aggregate demand. Section 5 concludes the paper.

2 OVERVIEW OF RELATED LITERATURE

The effect of household debt on the economy has been repeatedly examined in combination with recessions. Fisher (1933) postulated the debt-deflation theory of great depressions. Mishkin (1978) empirically examined the Great Depression and considered how household balance sheets served as a transmission mechanism for changes in aggregate demand.

The American recession of 1973-75 is empirically investigated by Mishkin, Gordon and Hymans (1977), who focus on the role of household debt and stock market developments. All of these papers find an important negative effect of debt on economic activity. However, whereas Fisher (1933) examines the effect on asset prices, Mishkin (1978) and Mishkin et al. (1977) focus on consumption and aggregate demand. Palley (1994) builds a model of the effects of household debt on aggregate demand based on the different propensities to consume among creditor and debtor households and applies the model to the recession of the early nineties. Palley (1994) concludes that increases in household debt fuel aggregate demand but that the servicing of this debt subsequently lowers aggregate demand. The financial crisis and economic downturn of 2007-09 have again drawn attention to the role of household sector debt. Keen (2009) emphasizes the role of debt for aggregate demand. Changes in the volume of debt as a percentage of GDP explain how much of the aggregate demand is debt financed. Keen (2009) validates the link between the household debt and aggregate demand for Australia by showing how both increasing debt and declining unemployment and decreasing debt and rising unemployment move together. The link between household debt and aggregate demand in the recent recession is shown for the United States in Mian and Sufi (2012) and Dynan (2012). Dynan (2012) uses the Panel Study of Income Dynamics (PSID) to examine the effect of household debt on consumption. She estimates the effect of leverage and that of debt service burdens on the changes in consumption that occurred from 2007 to 2009 and confirms that a significant negative impact exists even after income and wealth effects are controlled for. This approach provides a microfoundation for the deleveraging shock that depresses consumption in addition to wealth and income effects.

Overall, this paper is inspired and most closely related to the work by Mian and Sufi (2012), which investigates the link between household sector debt levels and aggregate demand

with a regional analysis. These authors use county-level data from the United States and estimate how household debt levels, measured as debt over income, influence consumption, which fuels aggregate demand. The size of the debt level is interpreted as the magnitude of the household balance sheet shock and of the need for adjustment to household-level finances. Mian, Rao and Sufi (2012) use local retail sales data to show that household debt levels affect consumption. Having illustrated the link between household debt and consumption, Mian and Sufi (2012) use the elasticity of employment to aggregate demand to measure the transmission of household debt via consumption and aggregate demand on employment and thus, to the severity of the crisis in the United States. The distinction between employment in the tradable and non-tradable sectors is important to the analysis. The demand for tradable goods is determined on a national or international level, which renders the shocks to the household balance sheet in one county unimportant. The demand for non-tradable goods, in contrast, depends only on local consumption. Thus, regional employment in tradable industries should be independent of local debt levels, whilst employment in non-tradable industries should instead be highly dependent on local debt levels. Mian and Sufi (2012) confirm the validity of their model by regressing the changes in total employment, tradable employment and non-tradable employment from 2007 to 2009 on the 2006 debt to income ratio. Controlling for economy-wide and structural shocks by using a difference-in-differences approach and by excluding construction employment does not change the outcome.

The International Monetary Fund (2012) and the McKinsey Global Institute (2010, 2012) reports cover more than one country. The IMF finds that larger increases in household debt lead to more severe recessions and examines country-level case studies in seeking to determine how to address large household debts and house price decreases. The McKinsey Global Institute

examines deleveraging across all economic sectors and describes how historic deleveraging processes have taken place (cf. McKinsey Global Institute (2010)) and how the major economies have meanwhile progressed in their deleveraging process (cf. McKinsey Global Institute (2012)). The case studies presented in that report suggest that during an economy-wide deleveraging, a country should begin with deleveraging in the private sector while the public sector compensates for the loss in aggregate demand; then, the latter should begin deleveraging once the nation's economic growth regains its momentum.

This study contributes to the literature by using existing approaches to investigate household debt, aggregate demand and unemployment in Spain and its provinces. This research can thus confirm that the previous results for the United States and Australia are also valid for a legally and culturally quite different region. Furthermore, this research indicates which portion of the increase in Spanish unemployment is traceable to the high household sector debt. Thus, this paper provides a fact base for Spanish and European policy makers as well as for macro-prudential regulators who are concerned with the effects of household sector debt on the economy.

3 THEORETICAL FRAMEWORK

The transmission mechanism of household debt to aggregate demand is as described by Keen (2009), Mian and Sufi (2012) or Dynan (2012). Using the permanent income hypothesis (PIH) or life cycle hypothesis (LCH), the households that expect higher future income (PIH) or that benefit from increased housing wealth (LCH) should adapt their consumption behavior and consume more. If the household's expectations regarding future income are sufficiently high, the

household can rationally take on debt today to smooth consumption. When a negative exogenous shock lowers the expectations of the household, the household will need to change its consumption and investment behavior accordingly. Households that have increased their debt more than others or that hold higher debt levels must reduce their debt by a larger amount. The household balance sheet is restructured through reductions in consumption spending. Still, it is not unquestionable that the aggregate demand is affected by the households that restructure their balance sheets. Households that have acted as lenders in the first place will have the option to consume more when the debt is repaid. Thus, in aggregate, there should be no effect on aggregate demand if the propensity to consume out of income is the same across households. Nevertheless, the aggregate demand might indeed be reduced if the debt overhang is sufficiently large and if the economy is stuck at the zero lower bound (cf. Eggertsson and Krugman (2012)).

The American subprime crisis of 2007 spread to the European and Spanish real economy in 2008. There was a peak in Spanish debt issuance in 2007 and a peak in Spanish employment in 2008. Thus, 2007 serves as a starting point for our analysis of the effects of household debt on aggregate demand. We argue that debt levels have an effect on consumption and, consequently, on aggregate demand. The transmission channel is the necessary restructuring of the household balance sheet. In a boom period, a household takes on debt, anticipating increases in future income and asset prices. The household spends this debt on the purchase of assets, the most important of which is housing, and on consumption expenditure. When the boom period ends, asset prices stagnate or shrink, and future income streams become more uncertain. Households consequently restructure their balance sheets in accordance with their updated expectations. The restructuring of balance sheets comes along with increasing saving and decreasing consumption expenditure. The higher the debt level of the household sector, the larger the amount of debt that

the sector must repay and the greater the reduction in consumption and, thus, aggregate demand. The level of debt is a good indicator because there is a natural limit to household debt in terms of debt service. The more debt a household sector holds, the larger the debt service burden, and this burden cannot exceed disposable income if one rules out Ponzi games. If interest rates do not change, an increase in the debt-to-income ratio will alter the debt service burden proportionally. If the aggregated household sector long-term consumption behavior does not change accordingly, a short-term drop in consumption must occur to soften the process of adjustment to the previous debt-to-income ratios. This drop in consumption will dampen the aggregate demand and, consequently, will decrease employment. For there to be an effect on aggregate demand, it is not even necessary for there to be a nominal decrease in debt volume. A reduction in the debt growth rate is sufficient to reduce the aggregate demand relative to previous periods when the income levels do not change because the total amount that is available for consumption is reduced.

The theoretical foundation for the investigation of the effect of household debt via the aggregate demand channel on unemployment is provided in Mian and Sufi (2012). To make our presentation self-contained we next lay out a short version of the model by Mian and Sufi. Differences arise because we look at increases in unemployment at a provincial level ΔU_p and the elasticity of unemployment to a reduction in consumption and aggregate demand η instead of employment losses at a county level Y_c and the elasticity of employment with respect to output demand β.

The model setup is as follows: households spend a fraction α of their income on non-tradable goods NT and the rest of their income $1-\alpha$ on tradable goods T. When households reduce their consumption, both, tradable and non-tradable goods are affected. Unemployment

reacts to this reduction in demand and increases according to the elasticity of unemployment to a reduction in aggregate demand η.

In this model, province p is hit by the demand shock δ_p. However, the total shock to a province γ_p consists of a reduction in demand for non-tradable goods in the respective province and a reduction in demand for tradable goods from the whole country that hits this province:

(1) $$\gamma_p = \alpha\delta_p + (1-\alpha)\bar{\delta}$$

where $\bar{\delta}$ is the average shock for tradable goods for each province:

(2) $$\bar{\delta} = \frac{1}{N}\sum_{p=1}^{N}\delta_p$$

The total demand-driven increase in unemployment in province p depends on the elasticity of unemployment with respect to output, i.e. $\eta\gamma_p$. Each province is furthermore exposed to a country wide shock ε that is equal to all provinces and a structural shock s_p that just affects province p. The total increase in unemployment ΔU_p in a province can thus be written as:

(3) $$\Delta U_p = \eta\alpha\delta_p + \eta(1-\alpha)\bar{\delta} + \varepsilon + s_p$$

The aggregate increase in unemployment that results from the debt-driven demand shock only (6) can then be calculated as the sum of the increases in unemployment in non-tradable sectors (4) and the sum of the increases in unemployment in tradable sectors (5).

(4) $$\sum_{p=1}^{N}\eta\alpha\delta_p = N\eta\alpha\bar{\delta}$$

(5) $$\sum_{p=1}^{N} \eta(1-\alpha)\bar{\delta} = N\eta(1-\alpha)\bar{\delta}$$

(6) $$N\eta(1-\alpha)\bar{\delta} + N\eta\alpha\bar{\delta} = N\eta\bar{\delta}$$

To derive econometrically the effect of this demand shock, the structural shock in province p and the country wide shock that affects all provinces equally need to be excluded. By using a narrow definition for the non-tradable sector that focuses on regional consumption that is not likely to be prone to a regional structural shock, we aim to exclude s_p from our calculation. The change in non-tradable sector unemployment for a province that is not exposed to a regional structural unemployment shock is given by equation (7):

(7) $$\Delta U_p^{NT} = \eta\alpha\delta_p + \alpha\varepsilon$$

As a next step, country-wide shocks are excluded by taking the differences between the provinces. We thereby assume that the decile of provinces with the lowest debt level $(p_1, \dots, p_5)$ does not suffer from a deleveraging shock, but that these provinces are a benchmark for developments that affect all provinces. We consequently compare all provinces to the province with the fifth-lowest debt level $(p = 5)$:

(8) $$\Delta\left[\Delta U_p^{NT}\right] = \Delta U_p^{NT} - \Delta U_5^{NT} = \eta(\alpha\delta_p - \alpha\delta_5)$$

$\Delta\left[\Delta U_p^{NT}\right]$ is set to zero for the five provinces with the lowest debt levels.

If we could directly observe the demand shock δ_p, the aggregated increase in unemployment in the non-tradable sector due to a debt-driven reduction in demand could be estimated as

$$(9) \qquad \Delta\left[\Delta\widehat{U}^{NT}\right] = \sum_{p=5}^{N} \Delta\left[\Delta\widehat{U}_p^{NT}\right] = \sum_{p=5}^{N} \eta(\alpha\delta_p - \alpha\delta_5) = \alpha N\eta\bar{\delta} - \alpha N\eta\delta_5$$

However, we cannot directly measure the demand shock δ_p. Therefore we proxy the size of this demand shock for each province by the level of household debt relative to GDP. Households with more debt need to reduce their spending by a larger amount. Thus, provinces with higher debt-to-GDP ratios experience larger drops in aggregate demand and larger increases in unemployment. We use our indicator of household sector debt in province p for the calculation of the increase in unemployment:

$$(10) \qquad \Delta\left[\Delta\widehat{U}_p^{NT}\right] = \left[E\left(\Delta U_p^{NT}\middle|Debt_p\right) - E(\Delta U_5^{NT}|Debt_5)\right]$$

This approach is suitable because we have a linear relationship between household sector debt levels and changes in non-tradable sector unemployment, which is shown in the empirical analysis and Figure 2. The increase in total unemployment that is related to the debt-related reduction in consumption can then be calculated by solving (9) for $N\eta\bar{\delta}$; i.e., multiplying the increase in non-tradable unemployment with the inverse of the share of non-tradable unemployment in total unemployment:

$$(11) \qquad N\eta\bar{\delta} \approx \frac{1}{\alpha}\sum_{p=5}^{N} \Delta\,\widehat{U}_p^{NT}$$

The term $N\eta\delta_5$ is thereby neglected in (11) because we make the conservative assumption that the decile of provinces with the lowest debt levels did not face a demand shock from too high debt burdens. This approach is taken to the Spanish data in Section 4.

4 EMPIRICAL EVIDENCE

The case of Spain is used in order to address one of the countries that is currently most heavily hit by the euro crisis, that experienced particularly high increases in debt and high levels of debt and that currently suffers from exceptionally high unemployment rates. Spanish households decreased their nominal debt outstanding in the 1st quarter of 2009 for the first time in over 20 years. On a yearly basis, modest deleveraging started in 2009 and paused in 2010; deleveraging accelerated in 2011 (cf. Figure 1).

The deleveraging shocks that hit Spanish provinces are rather homogenous in nature. However, the size of the shocks among provinces in Spain does still vary. By using the provinces' debt-to-GDP ratios, we ensure that the shock is heterogeneous in size and is thus suited to our analysis. The Spanish economy is quite homogenous in terms of institutions such as the labor market, the educational system, and credit provisioning. Because we focus on the non-tradable sector, we benefit from the fact that structural differences across provinces are larger for industrial production and tradable goods than for consumption behavior for non-tradable goods. Therefore, this Section focuses on regional analyses of Spain.

4.1 Description of the data

The Spanish regional data are taken from the Instituto Nacional de Éstadística (INE), the Spanish Ministry of Employment and Social Security (Ministerio de Empleo y Seguridad Social), the Spanish Ministry of Public Works and Transport (Ministerio de Fomento) and Eurostat. The regional level used in the analyses is NUTS-3,[3] i.e., the Spanish *provincias* are analyzed.

[3] NUTS levels (fr. *Nomenclature des unités territoriales statistiques* – Nomenclature of territorial units for statistics) are used for regional statistics in Europe. NUTS-3 is used to distribute the regional funds of the European Union.

Because there is no information on the overall household debt levels or the changes in household debt for the Spanish provinces, we require an alternative measure. This is found in the mortgage data for the Spanish provinces, which are provided by the INE. Mortgages account for 84% of total household debt, and this share is almost independent of the income percentiles according to the survey of household finances.[4] Thus, in this research, the volume of mortgages is a good alternative measure to total household debt. All of the mortgage data are monthly data that is available from January 2003 onwards. However, there is no information on the total level of mortgages outstanding but the monthly information indicates the number and volumes of newly issued mortgages, which we use to proxy the total level of mortgages outstanding. The mortgage data from the INE are split into different categories. This allows us to focus on housing mortgages.[5]

The mortgage data are used in the analyses in two different ways. First, because we do not have data on the level of household debt, we compare the aggregated mortgage issuances from 2003 and 2004 over the 2004 GDP with the aggregated mortgage issuances from 2005 to 2007 over the 2007 GDP. This comparison leads us to approximate the growth rate from the three years preceding the crisis compared to that of the two prior years. It also enables us to investigate the effects of an increase in mortgage issuances on the subsequent changes in aggregate demand.

[4] The ratio of 2008 mortgage debt to total debt ranges from a maximum of 85.3% for the top income percentile to a minimum of 82.3% for the second highest income percentile. The overall average is 84%. The differences in the income percentiles can be traced to the fact that the highest income percentile uses less than half of its mortgages for main residences, whereas the poorest 40% of households use 87% of their mortgages for main residences (cf. Bank of Spain (2011), p. 111 Table 6).

[5] The two major categories are agricultural land (which had a share of 6% from January 2003 to April 2011) and urban land (which had a share of 94%). Within urban land, there are multiple categories: housing (61%), lots (11%), and other urban land (22%). "Other urban land" includes commercial properties, garages, offices, and industrial buildings, but also buildings that include dwellings. Using total mortgages instead of housing mortgages generates results that are similar to the ones presented in this section; the significance levels remain the same, although the coefficients are smaller. These results are as expected because the effect of debt taken on for agricultural or business purposes should have less of an effect on household consumption (and, thus, employment in the non-tradable sector) than debt taken on for the purpose of housing.

Second, the volume of mortgages at a certain point in time can be approximated by the aggregated volume of newly issued housing mortgages in the five years preceding the crisis, i.e., from January 2003 until December 2007.[6] The household mortgage debt calculated in this indirect way is 85.3% of the total household liabilities in Spain at the end of 2007 (as documented by the Bank of Spain). This calculated debt level is a really good approximation of the actual debt level because it almost equals the total mortgage debt of households, which is at 84.1% of total household debt according to the survey of household finances (cf. Bank of Spain (2011), p. 111). The main reason why we underestimate the total household debt level is that our measure does not include credit card debt or personal loans. Our measure can be used if we assume that there is no systematic difference in the structure of household debt across regions.

For the analysis related to the debt level, we construct a ratio of debt to provincial GDP. The provincial GDP data that are used to calculate the debt-to-GDP ratios are based on Eurostat Figures. The unweighted mean household sector debt-to-GDP ratio across all provinces was 63% with a standard deviation of 27%. The average GDP per province in 2007 was 20.2 billion EUR. Excluding the two most important provinces (Barcelona and Madrid) yields an average GDP of 14.2 billion EUR. Eurostat also serves as the source of the population data used in this study, i.e., the data regarding changes in the size of the workforce, which are measured as the percentage change in the population of individuals between the ages of 15 and 64.

Real estate prices are included in the analysis to determine how the effects of household debt differ across the provinces that did or did not experience booms in the real estate sector. If the increase in debt was associated with a parallel increase in real estate prices, then the

[6] Mian and Sufi (2012, p. 12 and 13) use the debt-to-income ratio in their analysis but state that using the accumulation of household debt in the five years preceding the crisis as an alternative measure would not change the results of their analysis.

adjustments in aggregate demand might result from either real estate price developments or excessive debt levels. Controlling for real estate prices thus helps us to identify the purely debt-driven aggregate demand channel. The relevant data are provided by the Spanish Ministry of Public Works and Transport. All of the prices are mean prices of residential real estate transactions by province and quarter from 2004 to 2012. The average Spanish residential real estate price in the first quarter of 2004 was approximately 124,000 EUR. The price increased to approximately 190,000 EUR in the fourth quarter of 2007 (+ 53%) and reached approximately 148,000 EUR in the first quarter of 2012 (-22% vs. peak, +19% vs. Q1/2004). The unweighted mean increase in the prices across all provinces from the first quarter of 2004 to the maximum in each province was 89% with a standard deviation of 44%.

Aggregate demand is measured using the employment and unemployment channel. Employment rates and total nominal employment Figures for the provinces are obtained from the INE. The Spanish employment rate was 51.1% in the first quarter of 2005. That rate increased to 54.4% in the third quarter of 2007 and decreased to 45.3% in the first quarter of 2012. The employment and unemployment rates[7] already show a high and significant correlation with the provinces' household debt Figures. To determine the effect of debt on aggregate demand, it is necessary to identify the portion of unemployment that results from consumption in the individual provinces. To identify this effect, the unemployment data[8] by economic activity on a provincial level are obtained from the Spanish Ministry of Employment and Social Security. The

[7] We use the term "unemployment" for the sake of simplicity throughout this section, but the data from the Ministry of Employment and Social Security are somewhat broader and also include individuals such as seasonal workers and job seekers who are employed part time but are looking for full time jobs. In November 2007, the ratio of job seekers to total unemployed persons was 147%, indicating a future increase in unemployment. The ratio decreased to 136% in November 2010 and to 133% in September 2012. In 2007 and 2010, the majority of the excess job seekers were still regularly employed (approximately 50%).

[8] For this investigation, we use sectoral unemployment data from the regional level due to the dearth of data on sectoral employment in the provinces.

economic activities are split into 22 different groups. These groups are then clustered by the type of economic activity into the tradable sector, the non-tradable sector, construction or other sectors. Due to a change in the classification system for economic activities that occurred in 2009, we need to match the earlier classification system with the recoded one (cf. Table A.1). Consequently, not all of the groups are exactly matched, but the tradable and non-tradable sectors can be identified.

Because the demand for tradable economic activities is not bound to the place of production but to the entire economy the tradable sector faces similar shocks across all provinces. The economic activities that we classify as tradable are the extracting industries, the manufacturing industries, agriculture and fishing. All of the goods produced in these industries can generally be shipped to other provinces within Spain, although some agricultural and fishery products are linked to local markets, and the same applies to manufacturing industries that, for example, supply the local construction sector. However, employment data for the subgroups within the manufacturing sector are only available at the aggregate national level. Ideally, we would distinguish between manufacturing industries that produce for the entire Spanish market, such as the automobile industry, and manufacturing industries that only produce for local markets. Because some of the employment in the manufacturing sector is linked to the local markets, we expect to see a correlation between local spending and manufacturing. An even stricter distinction would eliminate any correlation between manufacturing, i.e., tradable goods, employment effects and household sector debt. Thus, the outcome of this exercise should be seen as rather conservative estimate for the tradable sector. If we could draw a more exact line within the manufacturing sector, the results would be even stronger.

The non-tradable industries produce goods that are linked to local consumption spending, as indicated by the 1993 definition "trade, repair of motor vehicles, motorcycles, household goods and personal items" and "private households with employed persons". (Retail) Trade activities like those conducted by grocery stores or clothing and shoe stores crucially depend on local consumption. The same is true of the personnel employed in household services. It is not necessarily true that the non-tradable sectors experience higher increases in unemployment than the tradable sectors because the employment elasticities with regards to consumption may be different and consumption on durables may be more affected. However, it is important to note that the non-tradable sector depends on aggregate demand on the *province* level, and the hypothesis to be tested builds on this link between debt and aggregate demand. To compare Spanish provinces with an average population of less than one million provides a granular view that is suited to disentangling the effect of household debt on aggregate demand.

4.2 Empirical analysis

The literature reviewed in Section 2 examines mainly the effect of deleveraging on the economy. The Spanish household sector as a whole has barely begun to reduce its debt outstanding relative to GDP. However, for us to investigate the deleveraging effect, the households do not necessarily need to have reduced their nominal debt outstanding. It is sufficient that they exhibit reduced growth in liabilities and consume less than in previous periods. The case of Spain is a good example of the mechanism in question: on average, from the beginning of 2003 to the end of 2007, the liabilities of Spanish households increased by approximately 6 percent of GDP per year.[9] In the period from the beginning of 2008 to the end of

[9] This percentage reflects an annual growth rate for nominal debt of 18% or an annual growth rate for the debt-to-GDP ratio of 10%.

2010, household sector debt increased on average by 1 percent of GDP.[10] Under the two simplifying assumptions that households spend all of their income and the net incurrence of liabilities on consumption and investment and that their income share as well as total GDP remained approximately constant from 2007 to 2010, a reduction in the debt growth from 6 percent of GDP to 1 percent of GDP means a reduction in spending of 5 percent of GDP without deleveraging (cf. Figure A.5 for a graphical illustration). An increase in the debt outstanding can thus still go in hand with a reduction in consumption expenditure. Therefore, an analysis of the debt-consumption link should not exclusively examine nominal deleveraging.

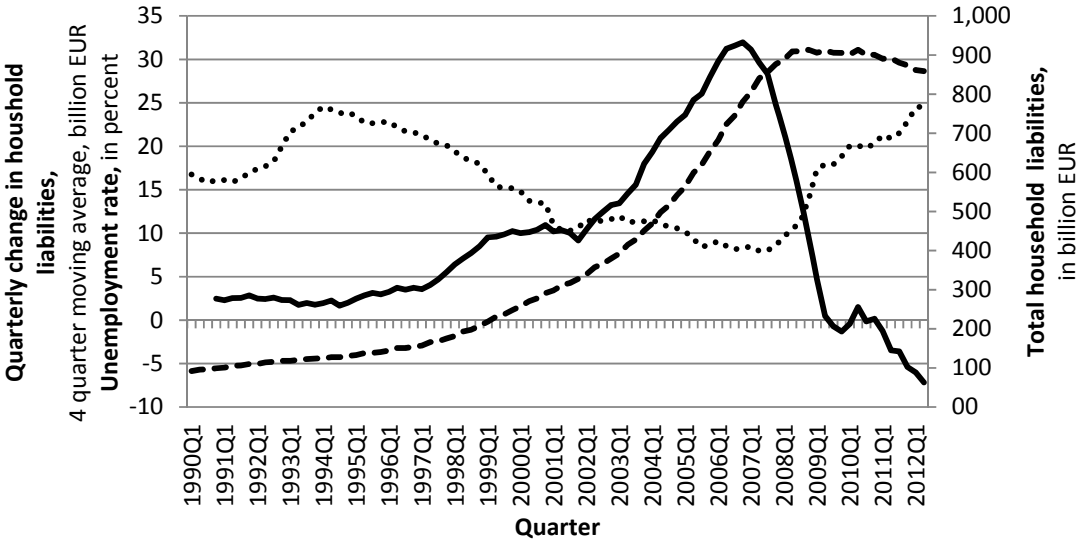
The sharp increase in Spanish household liabilities that occurred from 2003 to 2007 and the sudden elimination of these growth rates in 2008 due to a rather stable volume of total liabilities in 2009 and 2010 makes Spain a good case for analysis. Because substantial nominal deleveraging in Spain did not begin until 2011, the effect of the debt shock on consumption in Spain should therefore be smaller than it was in the United States, where deleveraging started earlier. Figure 1 depicts the development of the Spanish nominal household sector liabilities. Figure 1 also illustrates the relationship between debt and unemployment and thus supports our hypothesis. Starting in the mid-nineties, the unemployment rate in Spain decreased parallel to an increase in household liabilities. When the average quarterly net incurrence of household liabilities was at a peak, unemployment was at a low. When the growth of debt decelerated in 2007, unemployment stopped decreasing and as the debt growth paused in 2008 and became negative in 2009, unemployment intensified.

[10] This percentage is equal to an annual growth rate for nominal debt of 1% or an annual growth rate for the debt-to-GDP ratio of 1%.

Figure 1

Spanish household liabilities and unemployment

The total liabilities of the household sector, including non-profit institutions serving households, are plotted using end-of-quarter data as represented using the dashed line (right axis). The net incurrence of liabilities for the sector is plotted as solid line using a four-quarter moving average (left axis). The quarterly unemployment rate is plotted as dotted line (left axis). The correlation between the unemployment rate and the net incurrence of liabilities is 87%.



Source: Bank of Spain, INE.

Using the data to evaluate the hypothesis, we first examine the correlation between the increases in the provision of debt from the years 2003-04 to the years 2005-2007. Next, we examine the correlation between the level of debt in 2007[11] and the changes in unemployment in the different economic sectors from 2007 until 2010. The starting point for the employment Figures is November 2007, and the end point is November 2010. We use the November Figures because the real estate prices peaked in the fourth of quarter of 2007 and because the employment rate was at a high in the third quarter of 2007, which still includes the effects of tourism, i.e., part

[11] As explained in the paragraph with the data description, we treat the aggregated mortgage issuances from 2003 to 2007 as a proxy for the debt level.

of the tradable sector. In addition, we do not wish to include year-end effects in employment or unemployment. We limit the analysis to November 2010 to capture the first-round effects of the reduction in consumption. The decline in employment lost momentum in the second half of 2010, but the recession intensified again towards the end of 2011 and in 2012, along with capital flights. Using year-over-year changes, we select the data from November as the newest data in this study.

The correlation between household debt and unemployment at the province level is shown in Table 1. The results for the total unemployment rate are similar to the results for employment at the European country level. The level of debt is highly, significantly and positively correlated with the total unemployment rate. These results do not hold for increases in debt. Spanish households reduce their consumption more based on their total debt level and the resulting debt service and to a lower extent based on changes in their debt prior to the crisis.[12] When we distinguish between economic activities, larger increases in debt are linked to higher unemployment rates in the sectors that depend on local consumption, but the relationship is much stronger for debt levels. Unemployment in the economic sectors that are classified as non-tradable is even more closely tied to household debt than is unemployment in the construction sector. Unemployment in the tradable sector has no significant correlation with the level of debt. These correlation results support the hypothesis that household debt restrains consumption because employment that is linked to local spending is also tied to local household debt, whereas employment linked to nationwide spending is not.

[12] This relationship also holds when the increase is calculated as the increase in the average monthly mortgages issued in 2003 as compared to 2007, which reflects the second derivative of the debt level.

Table 1

Correlation of household sector debt and unemployment

The increase in debt is measured as the increase of the debt-to-GDP ratio from the cumulated 2003-04 level to the cumulated 2005-07 level. The level of debt is measured as the cumulative mortgage provision from 2003 to 2007 over GDP in 2007.

Sectoral unempl.	Increase in debt	Level of debt
Total	0.1901	0.5212***
Tradable	0.1383	0.2143
Non-Tradable	0.2498*	0.6490***
Construction	0.0106	0.3889***

*, **, *** denote significance at 10%, 5% and 1%.

Source: INE, Ministerio de Empleo y Seguridad Socia, Eurostat.

A further illustration of the described link is provided by a map of the Spanish provinces that shows the debt levels and the changes in non-tradable unemployment (cf. Figure A.1).

An alternative to examining the debt level and its subsequent effects on aggregate demand is to directly investigate the magnitude of the deleveraging. As described above, there are no debt data for individual provinces at the absolute household debt level. Thus, we compare the nominal volume of mortgages issued in the five years preceding the crisis to the amount of mortgages issued from the beginning of 2008 until April 2011, the latest month in our dataset. The reduction in mortgage issuance, calculated as the difference between the ratio of mortgage issuances to GDP from 2003 to 2007 and the same ratio for 2008 to 2011, is almost perfectly correlated with the debt level in 2007. The correlation coefficient of -98.3% clearly demonstrates that the debt level in 2007 is a good indicator of the subsequent developments in the debt ratio. For example, using the deleveraging effect in Table 2. changes the sign of the correlation coefficients, but the significance levels remain the same, and the coefficients change only marginally. Still, we abstain from using the deleveraging variable because it might generate endogeneity issues because it evolves simultaneously with unemployment.

Regressing sectoral unemployment on household sector debt validates these results (cf. Table 2). The level of household sector debt prior to the crisis has a significant positive effect on overall, non-tradable and construction unemployment and does not affect unemployment in the tradable sector. The effect of debt is approximately 10% stronger for the construction sector than for the non-tradable sector. Like the significance of household debt, the explanatory power of this household balance sheet shock is quite high, with an R^2 of 42% for the non-tradable sector. It is especially high compared to the results by Mian and Sufi (2012) who regress changes in employment on household debt levels without further control variables and obtain an R^2 of 8%. The coefficient of 0.78 implies that when the ratio of debt to GDP increases by one percentage point, the change in non-tradable unemployment from November 2007 to November 2010 is 0.78 percentage points higher. Whereas a province with a debt-to-GDP ratio of 50% experiences an increase in non-tradable unemployment of 39%, a province with a debt-to-GDP ratio of 51% experiences an increase of 39.78%.

Table 2

OLS regression of unemployment on household sector debt

The regressions are estimated using ordinary least squares, and heteroskedasticity-robust standard errors are used when necessary. The level of household debt in 2007 is calculated as the sum of the household mortgages from 2003 to 2007. The real estate boom dummy takes a value of 1 if the respective province is among the 25 provinces with the highest increase in real estate prices prior to the crisis or takes a value of 0 otherwise. "Change in the workforce" measures the percentage increase or decrease in the size of the working-age population, i.e., the number of 15- to 64-year-olds, in a province from January 1st 2008 to January 1st 2011. The "share of construction in Q1 2008" represents the share of construction employment in total employment in the first quarter of 2008, since Figures for 2007 were not available from the same database.

OLS estimation	Percentage change in unemployment from Nov. 2007 to Nov. 2010							
	Total		Tradable sector		Non-tradable sector		Construction	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Level of household debt in 2007	**0.70**	**0.60**	0.41	-0.02	**0.78**	**0.67**	**0.86**	**1.24**
(p-value)	(0.00)	(0.03)	(0.14)	(0.96)	(0.00)	(0.01)	(0.01)	(0.01)
Change in workforce		0.73		5.19		1.40		-6.46
(p-value)		(0.76)		(0.24)		(0.62)		(0.18)
Real estate boom dummy		-0.00		-0.04		-0.06		-0.09
(p-value)		(0.97)		(0.79)		(0.43)		(0.60)
Share of construction in Q1 2008		1.22		2.13		0.24		-0.20
(p-value)		(0.40)		(0.49)		(0.88)		(0.95)
Constant	**0.40**	0.30	**0.58**	0.56	**0.27**	0.33	**1.05**	**0.91**
(p-value)	(0.00)	(0.18)	(0.00)	(0.17)	(0.01)	(0.19)	(0.00)	(0.04)
N	50	50	50	50	50	50	50	50
R^2	27.2%	28.0%	4.6%	8.6%	42.1%	43.1%	15.1%	19.8%

Source: INE, Ministerio de Empleo y Seguridad Social, Eurostat.

Model (a) uses the level of household debt as the only explanatory variable. In model (b), we amend the estimation to include a dummy variable that takes a value of 1 if the respective province is among the 50% of provinces with the highest increase in real estate prices in the years preceding the crisis or a value of zero otherwise. Including an indicator for the provinces that saw a boom in home prices reflects the idea that these households may have over-borrowed to finance a house and may be especially vulnerable to decreases in house price during a recession. These decreases might also be steeper given a stronger increase beforehand. The results are robust to

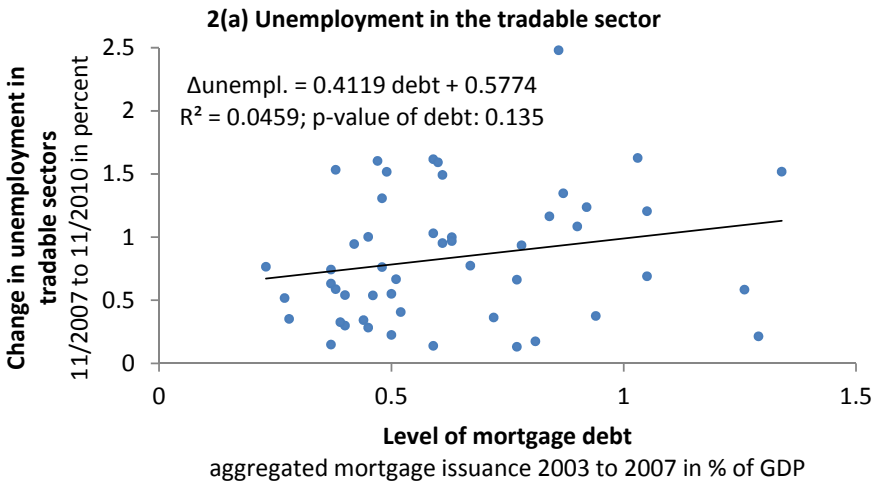
different definitions of the real estate dummy, e.g., if it takes the value of 1 for the top ten provinces only. The coefficients and significant levels also change only marginally if the real estate boom dummy is replaced for a variable that measures the percentage increase in real estate prices from 2004 to 2007. The second control variable is the change in the working-age population from 2008 to 2010. An increase in unemployment might only be linked to a stable total number of jobs and an increasing work force. However, changes in the workforce do not significantly affect unemployment in any sector. The third factor we control for is the share of construction employment in total employment. Provinces with a larger construction sector may suffer more from an increasing number of unemployed construction workers who cut back on consumption. This control variable is insignificant, too, and the inclusion of these three variables increases the R^2 by only a small amount.

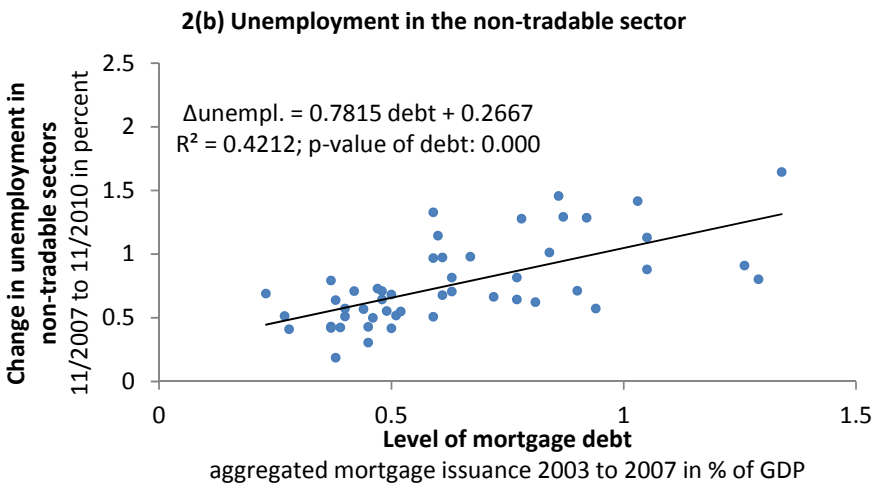
Plotting the 50 provinces in diagrams for the tradable and non-tradable sectors further illustrates these relationships with household sector debt (cf. Figure 2).

Figure 2

Household sector debt and changes in tradable and non-tradable unemployment

The level of mortgage debt is calculated as the sum of all mortgages provided from 2003 to 2007 divided by the GDP in 2007. The "unemployment" Figures for the tradable and non-tradable industries include unemployed persons and employed persons who are looking for jobs (e.g., part-time workers or seasonal workers). The scatter plots for the underlying economic activities are presented in Figure A.2 and A.3 in the Appendix.





Source: INE, Ministerio de Empleo y Seguridad Social, Eurostat.

The vertical axes of Figures 2(a) and 2(b) both have the same scale. Using the same scale highlights the larger variation in the tradable sector (which does not exhibit a relationship with

the provincial household balance sheet shocks) relative to the non-tradable sector, for which the observations are within a narrower band.

The reduction in consumption that generates increasing unemployment via the elasticity of employment to aggregate demand may be caused by a reduction in income (the PIH), a reduction in wealth, particularly housing wealth (part of the LCH), or an additional deleveraging effect caused by high leverage rates. Dynan (2012) disentangles these effects using micro data for the United States and finds that after income and wealth effects are controlled for, leverage is still highly significant and negative. The results presented in this study might also be attributed to a wealth effect following the burst of the real estate bubble. This pure wealth shock is difficult to separate from the shock that results from lower expected income or high leverage because all three lead to a household balance sheet adjustment via lower consumption expenditure. We try to address this issue with different robustness checks in the next Section.

4.3 Robustness checks

The control variable for real estate price developments in Table 2 is a first robustness check for a potential wealth effect. We use a boom variable rather than a bust variable to avoid simultaneity bias because the change in unemployment during the crisis negatively affects real estate prices. Because the real estate boom dummy is not significant, we ensure that the provinces with a real estate boom prior to the crisis did not perform better or worse in terms of local consumption (and thus non-tradable unemployment) during the crisis. Hence, the likelihood of a pure housing wealth effect is small.

A second robustness check that can be used to explore the distinction between real estate prices and household debt involves splitting the provinces into two groups and investigating their

extremes.[13] We distinguish between the provinces that show a high correlation between the changes in real estate prices and the changes in employment and those with a low correlation. A high correlation coefficient implies either that there is a direct link between real estate prices and employment or that there is at least one factor that is simultaneously determining the two variables. This group is prone to a wealth effect because decreasing house prices, i.e., decreasing wealth, may lead to decreasing consumption and reduced employment. A low correlation coefficient is a good criterion for the inclusion in a control group, as the provinces in question do not exhibit parallel movements in employment and real estate prices, nor are their employment and real estate Figures subject to a common influence; thus, no wealth effect should be present in these provinces. Of the Spanish provinces, 5 provinces are assigned to the high correlation group, as these have a correlation coefficient of 70% or higher. The 5 provinces with correlation coefficients of 5% or less, including negative correlation coefficients, are assigned to the low correlation group. The coefficient itself is calculated for year-on-year changes in real estate prices and employment levels between 2005 and 2012.

Next (cf. Table 3), we compare these two groups with regard to the change in real estate prices, employment and debt in the years prior to the crisis and during the crisis. This allows us to identify commonalities and differences between the groups and potential asymmetric effects of debt in the growth and contraction periods.

[13] This approach is similar to a case study approach. A case study is an appropriate method of investigation for this purpose because the small number of observations makes econometric tests unreliable.

Table 3

Development of real estate prices, employment and debt in the provinces with high and low correlations between changes in employment and real estate prices

The correlation coefficients for changes in employment and real estate prices differ across provinces. The first cluster of provinces consists of the 5 provinces (Alicante, Balears, Castellón, Madrid and Málaga) with the highest correlation coefficients (>70%) in the period from the first quarter of 2006 to the first quarter of 2012. The second cluster consists of the 5 provinces (Caceres, Lugo, Ourense, Palencia and Soria) with the lowest correlation coefficients (<5% or even negative). The correlations are calculated using year-over-year changes and quarterly data. Forming the groups using correlations between the levels of real estate prices and employment yields similar results. Developments in real estate prices and employment are measured from the start of the time series until the national peak for real estate prices and from that point in time until the latest available data. Debt is provided as described above and is comprised of the total mortgage issuance from 2003 to 2007, which (1) serves as an indicator for the increase in debt during the boom period and (2) serves as proxy for the debt level and the size of the shock at the end of 2007. All of the data are unweighted means across the groups.

		Group (a)	Group (b)
Boom-period	Time span	High (≥ 70%), 5 provinces	Low (≤ 5%), 5 provinces
Real estate prices	(Q1/2004 to Q4/2007)	+61%	+69%
Employment rate	(Q1/2005 to Q4/2007)	+5%	+5%
Non-tradable unemployment	(05/2005 to 05/2007)	-1%	-9%
Debt over GDP (1)	Accumulation of debt from 2003 to 2007	95%	34%
Crisis-period			
Real estate prices	(Q4/2007 to Q1/2012)	-24%	-8%
Employment rate	(Q4/2007 to Q1/2012)	-20%	-14%
Non-tradable unemployment	(11/2007 to 11/2010)	+102%	+48%
Debt over GDP (2)	Accumulation of debt from 2003 to 2007 - size of the shock	95%	34%

Real estate prices: On average, the provinces in both groups experienced a similar increase in real estate prices prior to the crisis. The high-correlation provinces experienced an increase of 61% from 2004 to 2007, and the value for the low-correlation provinces is slightly higher at 69%. Consequently, it appears that the boom in real estate prices and the resulting wealth effect are not good individual indicators of the subsequent changes in employment. Nor can we say that some provinces experienced a real estate price bubble and others did not simply

by examining the isolated increase in real estate prices. Nevertheless, we cannot rule out the possibility that an increase of 60% in one province is speculative but that the same increase in another province is based on fundamentals. During the crisis, the provinces with a high correlation coefficient suffered from decreases in real estate prices that were three times higher than the decreases in the provinces with a low correlation coefficient. The declines in the price levels from the fourth quarter of 2007 to the first quarter of 2012 for the high- and low-correlation provinces were 24% and 8%, respectively. Consequently, these two groups were similar prior to the crisis but differed during the crisis.

Employment: Both groups of provinces experienced the same increase in employment during the boom. The low- and high-correlation provinces both experienced an increase of 5%. The declines in employment rates during the crisis differed, but the difference is not as large as the gap between the declines in real estate prices in the two groups. The low-correlation provinces experienced a decline of 14% in employment, and the high correlation provinces suffered a decline of 20%. The differences between the two groups are larger when we consider non-tradable unemployment. The first group had a decrease of -1% during the boom, whereas the second group faced a decrease of -9%. During the crisis, the divergence became even more apparent: the first group had an increase of 102%, whereas the second group experienced an increase of 48%. As with real estate prices, there were similarities during the boom and divergences during the crisis.

Household debt: According to our hypothesis, the explanation for the difference between the high- and low-correlation provinces should be the debt level. Although the two groups had a similar increase in real estate prices and employment, the group with higher employment losses should have been exposed to a higher debt level that created a greater need for household balance

sheet adjustments. In both groups, a decline in real estate wealth puts pressure on consumption via the mechanism described by the life cycle hypothesis. However, the group that is exposed to higher debt should suffer more because of the additional deleveraging effect. Indeed, the provinces with a high correlation coefficient had a higher debt level at the beginning of the crisis and also accumulated more debt prior to the crisis. The debt levels are almost three times higher; they are 95% and 34% for the high- and low-correlation provinces, respectively.

There might be other factors that distinguish the two groups from one another and that act as the underlying drivers of development. Income levels or industry structures could be affected by idiosyncratic shocks independent of the debt level. The provinces with the high debt levels are, for example, much larger in terms of population and GDP, and their GDP per capita exceeds that of the low-correlation provinces by 22%, primarily because of Spain's capital, Madrid. The employment structure, which is an indicator of the industry structure, also differs across the two groups. The low-correlation provinces depend more on agriculture (11% vs. 2%) and industrial employment (17% vs. 13%) but less on service sector employment (60% vs. 71%). However, the shock that affects the provincial service sector more strongly than it affects the provincial agricultural or industrial sector is a reduction in demand. When we consider these regional discrepancies, household over-indebtedness again emerges as a reasonable explanation for the shock affecting those provinces.

Thus, we conclude that high household debt levels force households to cut back on consumption expenditure, which then triggers a decline in employment. The wealth effect is still apparent, and real estate prices and employment during the crisis are intertwined, but an analysis of these two groups of provinces makes it clear that household debt has a strong and negative effect on aggregate demand in times of crisis. Another interesting result of this robustness check

is the asymmetric effect of household debt. Although neither employment nor real estate prices react to differences in debt accumulation prior to the crisis, there is a large difference in their reactions once the debt growth stops and debt is reduced.

As a third robustness analysis we address the issue that decreases in consumption may only reflect decreased consumption spending by unemployed construction workers and household debt was of no significant influence. Therefore, we split the sample of the 50 provinces in 25 provinces with a high share of construction employment prior to the crises and 25 provinces with a low share of construction employment (cf. Table 4).

Table 4

OLS regression of unemployment on household sector debt for provinces with high and low shares of construction employment

All variables and the estimation are as described in Table 2. *Low* represents the 25 provinces with the lowest share of construction employment in the first quarter of 2008. *High* represents the 25 provinces with the highest share, respectively.

OLS estimation	Percentage change in unemployment from Nov. 2007 to Nov. 2010					
	Total			Non-tradable sector		
	All provinces	High	Low	All provinces	High	Low
Level of household debt in 2007	**0.60**	0.48	1.09	**0.67**	0.39	**1.31**
(p-value)	(0.03)	(0.21)	(0.00)	(0.01)	(0.23)	(0.00)
Change in workforce	0.73	-0.21	-0.88	1.40	4.06	-1.23
(p-value)	(0.76)	(0.97)	(0.60)	(0.62)	(0.44)	(0.47)
Real estate boom dummy	0.00	0.17	-0.12	-0.06	0.06	**-0.12**
(p-value)	(0.97)	(0.32)	(0.16)	(0.43)	(0.63)	(0.10)
Share of construction in Q1 2008	1.22	4.38	0.64	0.24	1.61	0.48
(p-value)	(0.40)	(0.36)	(0.83)	(0.88)	(0.66)	(0.85)
Constant	0.30	-0.23	0.17	0.33	0.19	0.00
(p-value)	(0.18)	(0.77)	(0.53)	(0.19)	(0.78)	(0.99)
N	50	25	25	50	25	25
R^2	28.0%	17.6%	60.7%	43.1%	26.2%	76.7%

Source: INE, Ministerio de Empleo y Seguridad Social, Eurostat.

In provinces with a high share of construction employment, other factors besides the debt level of households determine the increase in unemployment. However, provinces that are not affected by disruptions in the construction sector of the same magnitude because the construction sector is of minor importance, household debt turns out to be even more significant and economically more important in determining developments in the employment sectors via the aggregate demand channel.

This analysis consequently backs both, the argument for the importance of the construction sector unemployment for consumption spending, aggregate demand and other sectors' unemployment *and* the argument that debt levels are responsible for the thriftiness of households, which leads to increasing unemployment.

4.4 The aggregate effect of household debt on unemployment

The change in household expenditure patterns does not exclusively affect local non-tradable employment through the consumption channel. Households also cut back on spending on durable goods and housing. If there were a proportional reduction in consumption and investment spending and if net exports did not matter, then employment in manufacturing and other tradable industries would be reduced on the same scale as in the non-tradable industries. Using this corollary, we follow Mian and Sufi (2012) and their theoretical framework, which we adapted for the case of Spain (cf. Section 3). In this Section we calculate the aggregate increase in unemployment in Spain that resulted from a drop in household expenditures due to deleveraging which was transmitted to the labor market via the aggregate demand channel.

The estimation results presented in Table 2 reveal that every additional percentage point of debt relative to GDP leads to an increase of 0.78 percentage points in the change in

unemployment. We first calculate the number of unemployed persons in the non-tradable sector that resulted from the high level of household debt. For this purpose, we use the linear relationship between the debt levels in 2007 and the changes in unemployment that occurred from 2007 to 2010. However, we account for the fact that households have always been indebted to some extent; in the analysis, we only incorporate the debt that exceeds the debt level of the five provinces with the least debt; i.e., we subtract 0.37 from every province's debt level to calculate the related increase in unemployment. The debt-related change in non-tradable unemployment ΔU_p^{NT} is then calculated as follows:

$$\Delta U_p^{NT} = \left(Debt_p - Debt_5\right) * \beta * U_p^{NT} = \left(Debt_p - 0.37\right) * 0.78 * U_p^{NT} \tag{12}$$

where $Debt_p$ is the level of debt in province p in 2007, and $Debt_5$ is the level of debt in the province at the lowest debt percentile. The effect of debt on unemployment is expressed by β and is 0.78. U_p^{NT} is the total number of unemployed in the non-tradable sector in province p in November 2007. Aggregating equation (12) across all provinces with $Debt_p > Debt_5$ yields the total increase in debt related non-tradable sector unemployment in Spain. Non-tradable unemployment, as classified in Section 4.1, increased from approximately 368,000 in November 2007 to approximately 677,000 in November 2010. According to the calculation used, an increase by approximately 100,000, or 33% of this increase, is related to the indebtedness of the household sector.

The change in total unemployment is then calculated by applying the effect of debt on non-tradable unemployment to all of the other sectors. The share of non-tradable unemployment within total unemployment increased slightly from 11.9% in November 2007 to 12.1% in November 2010. Therefore, the change in non-tradable unemployment is divided by the share of

non-tradable unemployment (cf. equation (11)). This calculation yields a total of approximately 860,000 unemployed persons, or 34.5% of the change in unemployment, as a result of the household debt or aggregate demand shock.[14]

According to the approach introduced in this study, 2/3 of the increase in Spanish unemployment is unrelated to the demand effects that stem from over-indebted households. According to our estimates, the policies directed at reducing the debt burden of households therefore address only 1/3 of the unemployment issue. However, our results do not necessarily point towards structural problems of the Spanish economy and labor market because the remaining 2/3 of the increase in unemployment that is not explained may result from other demand factors, such as a reduction in government spending. Further disentangling and explaining the surge in unemployment in detail is beyond the scope of this study, but we briefly describe some other major sources for this important issue. Most construction activities stopped when the real estate bubble burst, which resulted in an increase in unemployment in this sector. The construction sector accounts for 21 % of the total increase in unemployment that occurred from November 2007 to November 2010, and the increase of 159 % that was observed in this sector is twice as high as the average increase in unemployment.[15] The household balance sheet restructuring and the end of the real estate bubble explain more than half of the increase in unemployment. Finally, the sectors that exhibit an above-average increase in unemployment include trade and repair of vehicles (86 %), the hotel sector (83 %), transportation and warehousing (84 %) and health and social work activities (91 %).[16] The increase in

[14] This method is valid, when we consider a closed economy. Jobs in tradable sectors that partly dependent on foreign demand are not subject to the Spanish reduction in demand.

[15] Unemployment in the construction sector was approximately 331,000 in November 2007 and 858,000 in November 2010. However, this increase of 527,000 is not completely related to the construction sector due to the reclassification of the employment groups in 2009 (cf. Table 2).

[16] We cannot provide the amount of increase for all sectors due to the reclassification of the economic activities.

unemployment in the group of people classified as “without previous employment” contributes 7.4% of the total increase of unemployment. The increase in this category is 64.2% and consequently below the average national increase, but it cannot be compared to the changes in other sectors because it represents unemployed persons that have only recently entered the working population. Thus, only a few sectors exhibit an above-average increase in unemployment, which highlights the problems stemming from the construction and non-tradable sectors.

5 CONCLUSION

We investigate in detail the situation of the Spanish provinces regarding their debt levels and changes in unemployment. We found that the pre-crisis mortgage debt levels had strong positive effects on changes in the provincial unemployment rates during the crisis. This finding is consistent with the results of Mian and Sufi (2012) and highlights the relevance of household indebtedness to unemployment. Furthermore, the explanatory power of the estimation presented in this study is more than five times higher compared to the estimation presented by Mian and Sufi (2012), which has an R^2 of 8%. Our results indicate that approximately 1/3, or approximately 860,000 people, of the aggregate increase in unemployment in Spain between 2007-2010 can be traced back to high household debt levels. This compares to approximately half of the effect for the United States found by Mian and Sufi (2012).

There are many reasons why the household debt levels might be somewhat less important in explaining the increase in unemployment in Spain than in the United States: unsolved problems in the Spanish banking sector, ongoing problems with labor market rigidities, a

different consumption share in the economy, and, perhaps most important, the fact that Spanish households have not yet reduced their debt relative to GDP on an aggregated basis on a comparable level relative to US households. A slight decrease (less than 1 percent) was observed in nominal liabilities in 2009. In 2010, this decrease was even lower (approximately 0.5%). The household sector increased its deleveraging on a nominal basis in 2011 with a decrease by 3% and 2% in the first and second quarters of 2012, respectively. If we take inflation into account, the nominal decrease of 6% from the peak is even larger in real terms. In the United States, in contrast, households have decreased their debt-to-GDP ratio by more than 13 percent since the end of 2009, which has exacerbated the decrease in consumption spending. The results of this analysis are unambiguous. The increasing unemployment in Spain is an explicit consequence of the relative lack of consumer demand. The combination of private sector balance sheet restructuring with a parallel government austerity program is currently amplifying the effects of shrinking consumption on aggregate demand and employment.

This study corroborates the findings of previous studies using aggregated data and household survey data for other European countries and the United States. These data support the hypothesis that debt levels do matter for consumption at the household and household sector levels. The transmission mechanism from debt levels via the aggregate demand channel to unemployment rests upon the assumption that the household sector suffers from a negative economic outlook, which lowers lifetime incomes and forces households to cut back on consumption to adjust their balance sheets. Furthermore, different income and wealth groups have different propensities to consume, and thus, the reduced consumption of debtors is not equally offset by the increased consumption of creditors who are paid back the money that they have loaned.

Although this paper has elucidated an important question regarding how debt and demand are interlinked, interesting and important related questions should be considered in future research. For instance, what occurs if more foreign debt is affected by deleveraging? How do simultaneous processes of private and government sector balance sheet restructuring compare to a two-step deleveraging process in which one sector initially stabilizes the other? Furthermore, a portion of the increase in unemployment is attributed to the creation of jobs during the debt-fueled period of economic growth. Comparing two groups of provinces to control for the effects of real estate price development, we partially address this issue of asymmetric developments. However, a more detailed comparison of the employment effects of debt during expansionary and contractionary periods will be necessary to provide policy makers and regulators with advice on how to combine sound finances with employment growth.

APPENDIX

Table A.1

Economic activities with old and new classifications

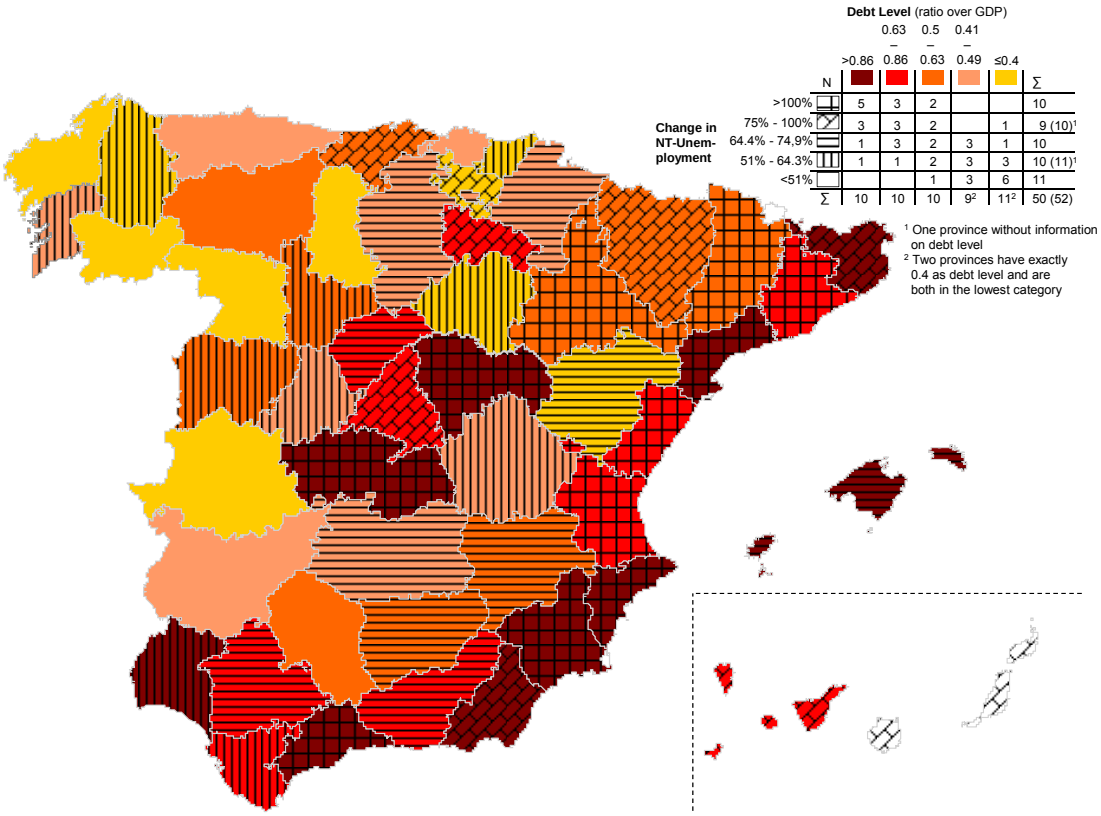
Economic activities are matched based on their old and new descriptions. The percentage of subcodes indicates how many of the previous subcodes could be matched one to one.

Category	Economic activity (CNAE 1993)	Economic activity (CNAE 2009)	Percentage of subcodes that are matched	Share in total unemployment Nov. 2007/ Nov. 2010
Tradable	A - Agriculture, livestock farming, hunting and forestry	A - Agriculture, livestock farming, forestry and fishing	90%	21.3% / 18.7%
	B - Fishing			
Tradable	C - Extracting industries	B - Extracting industries	87%	
Tradable	D - Manufacturing industries	C - Manufacturing industries	94%	
Non-Tradable	G - Trade, repair of motor vehicles, motorcycles, household goods and personal items	G - Wholesale and retail trade, repair of motor vehicles, motorcycles	93%	11.9% / 12.1%
Non-Tradable	P - Private households with employed persons	P - Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	100%	
Construction	F - Construction	F - Construction	98% of the old "F" category can be matched to entries in the new "F" category, but these entries cover only 81% of the new "F" category	10.7% / 15.4%

Figure A.1

Debt and unemployment in the Spanish provinces

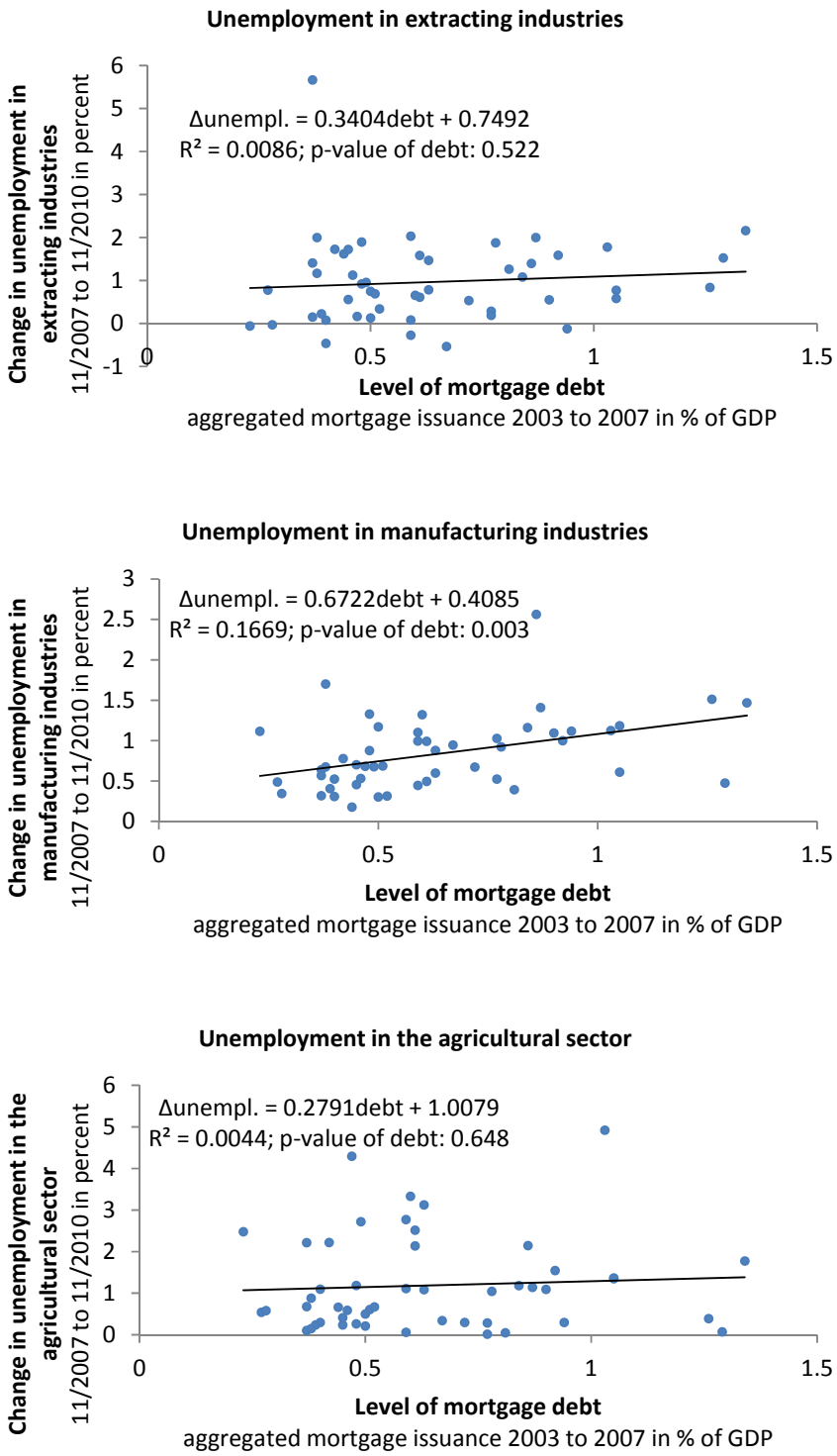
Provinces with higher debt levels in 2007 (darker colors) experience a steeper increase in unemployment.



Source: INE, Ministerio de Empleo y Seguridad Social.

Figure A.2

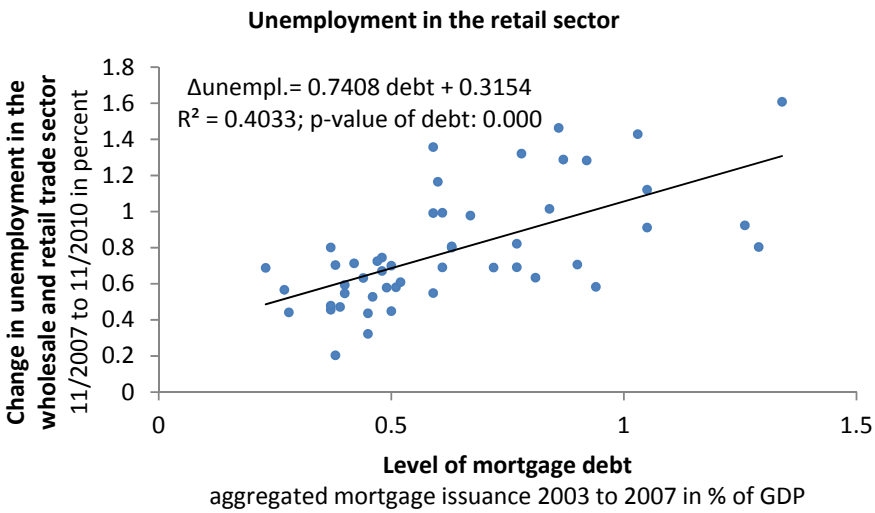
Household sector debt and tradable employment sectors

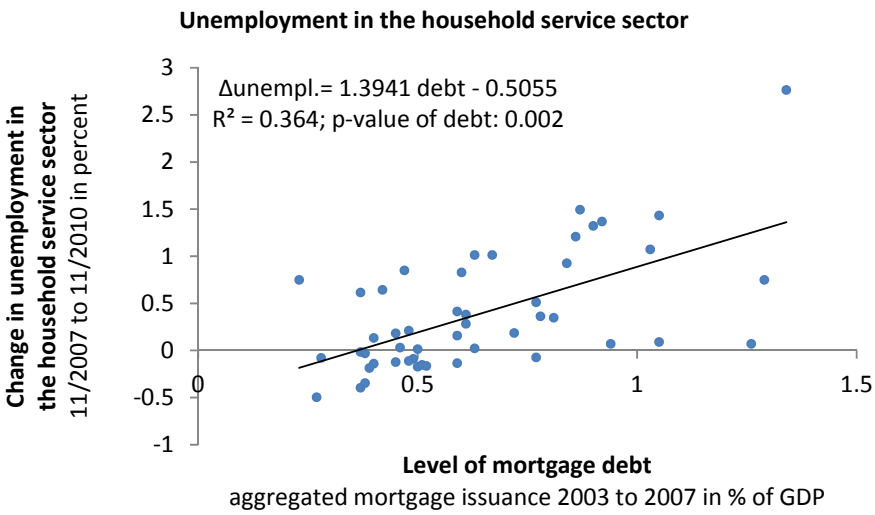


Source: INE, Ministerio de Empleo y Seguridad Social.

Figure A.3

Household sector debt and non-tradable employment sectors





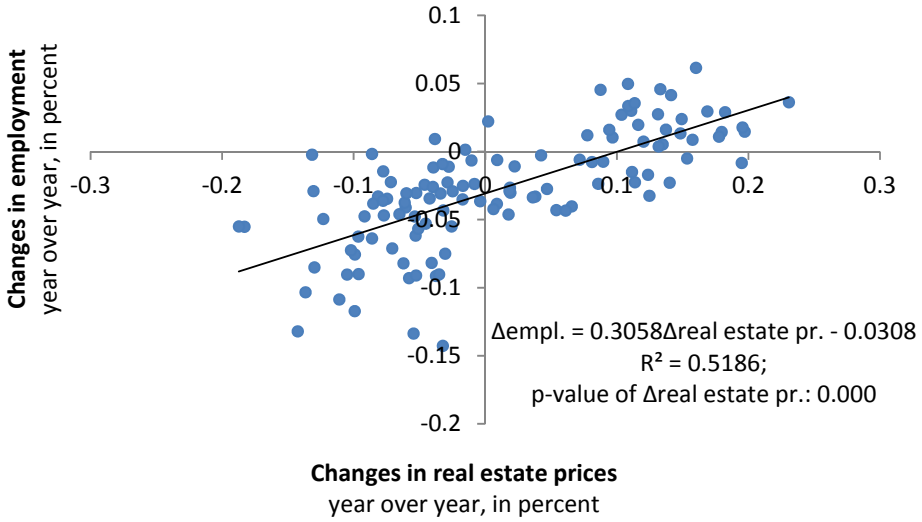
Source: INE, Ministerio de Empleo y Seguridad Social.

Figure A.4

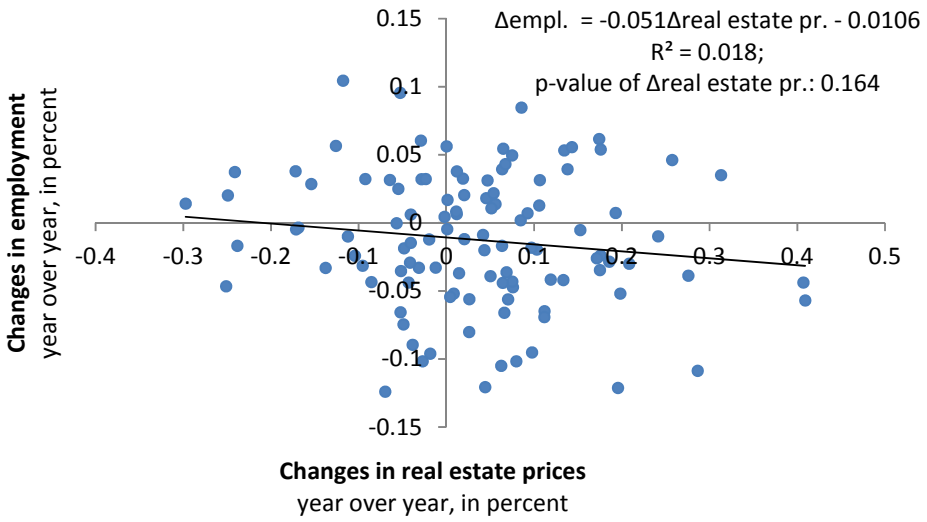
Changes in real estate prices and employment in the Spanish provinces

Table 2 shows the development of real estate prices, employment, and debt in two groups of Spanish provinces. The groups are clustered depending on the correlation between the changes in real estate prices and the changes in employment from the first quarter in 2006 until the first quarter in 2012. Group (a) consists of the five provinces with the highest correlation, which are shown in Figure A.4(a), and group (b) consists of the five provinces with the lowest correlation, which are shown in Figure A.4(b). The linear trend lines illustrate the high and low correlations.

A.4(a) High correlation provinces



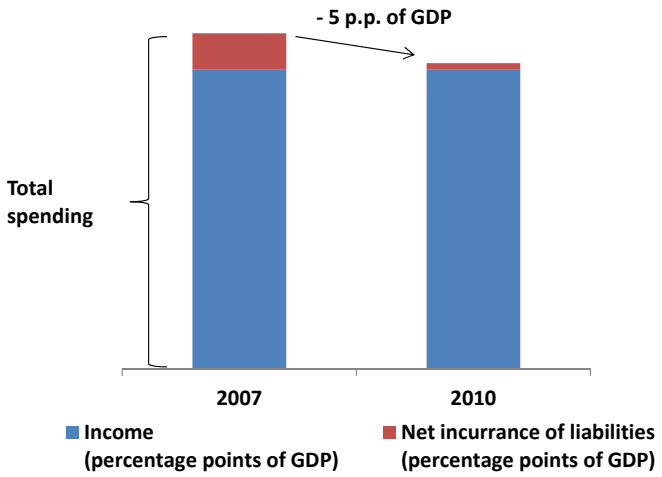
A.4(b) Low correlation provinces



Source: INE, Ministerio de Fomento.

Figure A.5

How a reduction in debt growth affects spending



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