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The Portuguese Slump-Crash and the Euro-Crisis

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The Portuguese Slump and Crash and the Euro Crisis[*]

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Abstract

Between 2000 and 2012, the Portuguese economy grew less than the United States during the Great Depression or than Japan during the Lost Decade. This paper asks why this happened. It makes four contributions. First, it describes the main facts between 2000 and 2007, proposing a narrative for why the country did not grow. Second, it puts forward a model of credit frictions where capital inflows are misallocated, so that more integrated capital markets can lead to losses in productivity and an expansion of unproductive nontradables at the expense of productive tradables. Third, it argues that this model can account for the Portuguese slump, as a result of misallocated capital inflows and increases in taxes. Fourth, it shows that the crash after 2010 came with a sudden stop of capital flows, combined with fiscal austerity, downward nominal rigidities, and a diabolic loop between banks and sovereigns.

1   Introduction

Writing ten years after the introduction of the euro, the vice-president of the ECB stated unequivocally that: "The euro has been a resounding success" (Papademos, 2010). The euro was by then a reserve currency and inflation was stable and on target. Economic growth was the same as in the previous two decades but employment had increased significantly, while capital markets had become more integrated and souther Europe had benefitted from sustained low interest rates. Papademos further argued that the countries within the Euro-area had been better protected from the financial crisis of 2007-08 than others in the European Union.

At the same time, even before the financial crisis, there were warning signs about some of the countries in the Euro-area. One of the more pressing alerts came from the small country of Portugal, and was brought to attention in a notable article, Blanchard (2007). Portugal had been in a slump since 2000, with anemic productivity growth, almost no growth, and increasing unemployment. At the same time, wages were rising and the country's competitiveness was falling, while both the government and the country were accumulating debt at a rapid pace. Most, but not all, of the same issues were also present in Greece, Ireland and Spain. They did not seem so pressing since their economies were growing and, with the exception of Greece, fiscal consolidation was under way.

Still, in 2008, many would dismiss these alarm signs. The large amounts of borrowing from abroad could be the result of borrowing against expected future growth on account of economic convergence to the European core. Or, perhaps Portugal was becoming the "Florida of Europe", to where wealthy northern Europeans were sending their capital in expectation of migrating for their retirement. The Portuguese slump was greeted with the, as often repeated as it is sterile, recommendation for structural reforms that is the constant message to Portugal since it joined the European Union in 1986, almost regardless of the

state of the economy.

The severity and extent of the Euro-crisis that has affected so many European countries since 2009 dismisses this complacency. Understanding what has been happening in Europe is one of the great challenges facing macroeconomists today. Portugal did not have a housing boom like Spain and Ireland, nor as rampant an increase in public debt as Greece, nor does it have Italian political instability. Yet, since 2010, all five countries have been in a similar crisis. Because Portugal was one of the first countries where symptoms were identified, it is a good place to look for cues on what is behind the crisis. This is the primary goal of this article.

There are a few more reasons why understanding what happened to the Portuguese economy since 2000 is of interest. First, growth has been as bad as it gets for an advanced economy. Figure 1 shows real GDP per capita since 2000 for Portugal, next to the same measure for the United States from 1929 to 1941, and in Japan from 1992 to 2004. While Portugal never went through a steep contraction like the United States in the 1930s, relative to the start of the crisis, its citizens are today poorer than the ones that went through the Great Depression or the Lost Decade. These extreme periods of dismal economy performance offer the opportunity of learning about the mechanisms that drive the macroeconomy, beyond the obvious potential of this work for welfare.

Second, the main features of the crisis are remarkably similar to the well-documented capital inflows and sudden stops in Latin America in the past twenty years (Calvo, Leiderman and Reinhart, 1996), or to the crisis in the Nordic countries in the early 1990s, and the Greek contraction has already far supplanted the depth of the record-breaking Finnish recession of 1991-93 (Honkapohja and Koskela, 1999). The events in the euro-crisis give a new testing ground for our understanding of capital account liberalization (Henry, 2007), sudden stops (Calvo, 1998) and fixed exchange rates (Schmitt-Grohe and Uribe, 2011).

Third, Portugal was one of the fastest growing countries in the world during the 15

Figure 1: The Portuguese Lost Decade(s)
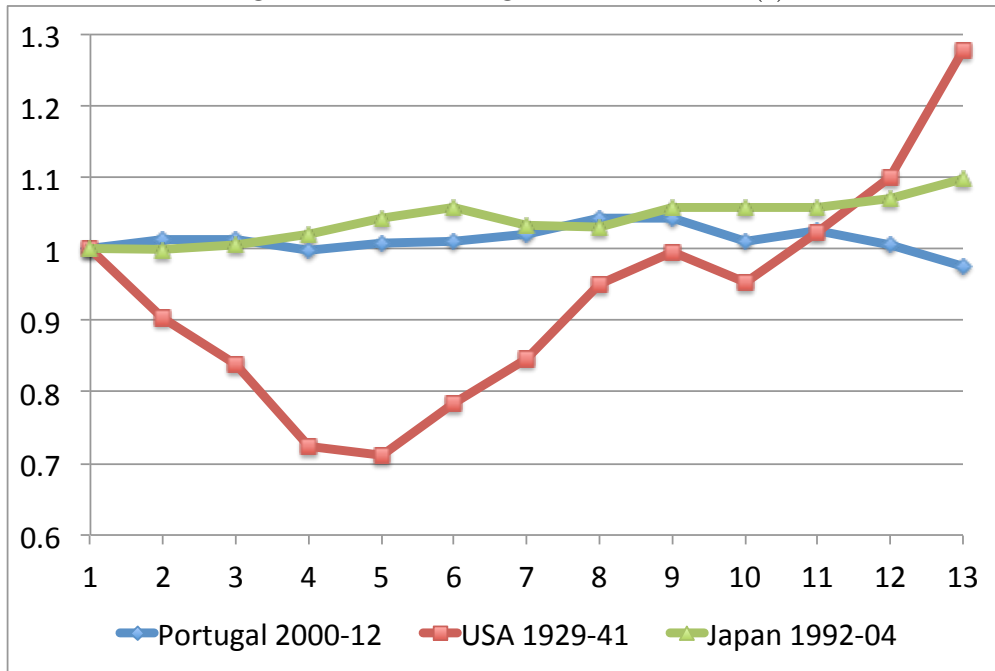
years after it joined the Economic Free Trade Area in 1959. The years after joining the then European Community in 1986 were likewise marked by great progress. Yet, joining the European Monetary Union came with a prolonged slump. Understanding the difference between these episodes provides lessons for the study of the benefits and costs of economic integration.

While it is important, explaining the evolution of the Portuguese economy since 2000 is not easy. Why were there such large capital inflows? Why did they come even though productivity stopped growing? Why did the economy slump, in spite of the availability of this capital? And why did Greece, Ireland, and Spain, under similar circumstances and facing similar shocks, boom at the same time? These are some of the questions this article tries to answer.

Section 2 presents the key facts that make the behavior of the Portuguese economy both interesting and puzzling. Because there was not a deep and quick contraction, like in the United States during the Great Depression, it is hard to identify one visible sudden shock

that triggered the events that followed. Portugal is instead closer to Japan, with a prolonged period of no growth producing competing hypothesis to explain it. Section 2 puts forward a narrative to explain the 2000-07 period when the economy was barely growing in spite of large capital inflows. I call this period the *slump*. I propose that the Portuguese slump was the result of two shocks and two circumstances. The first shock was the large capital flows with the integration of capital markets that followed the euro, and the circumstance was the under-developed Portuguese financial market. The capital flows were mis-allocated, leading to an expansion in unproductive non-tradable sectors, and did not lead to any significant gains in productivity. The second shock was an increase in taxes due to past commitments to old-age pensions, that were not altered in time. Section 2 also discusses with skepticism some alternative causes for the slump, including trade shocks, discretionary fiscal spending, and rigid labor markets.

To further investigate this explanation, section 3 presents a model of an open economy with two key ingredients. First, there is both a tradables and a non-tradables sector. Second, credit is allocated in the non-tradable sector through a banking system that collects funds domestically and from abroad subject to collateral constraints. The shock that triggers the slump of 2000-07 is the relaxation of the financing constraint from foreign capital, partly as a result of the euro (Lane, 2012*b*). Because the inflow of capital is mis-allocated and taxes increase, the economy slumps at the same time as the real exchange rate appreciates and the non-tradable sector expands. I conclude by arguing that, if taxes had not risen and the economy were more financially developed, then the same model that explains the Portuguese slump, can also account for the booms in Ireland and Spain during this period.

Section 4 deals with the sudden stop and crisis, that starts in Portugal at the start of 2012. I call this stage the *crash*. I present the main facts and interpret them in a way consistent with the account for the slump. The Portuguese experience is not markedly different from existing models of the Euro-crisis, so I discuss their key ingredients and how they match the

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Portuguese evidence. Section 5 concludes.

2   The Portuguese slump: facts and a narrative

A typical paper describing the weaknesses of the Portuguese economy invariably mentions:

- The low years of schooling, an inheritance of the dictatorship that ruled between 1933 and 1974 without making a serious investment in literacy or higher education. In the Barro and Lee (2010) dataset, average years of schooling for those aged above 25 was 4.1 in Portugal in 1975, compared to 8.9 in Ireland, 6.3 in Greece, or 5.6 in Italy. By 1995 these gaps had barely reduced.

- The low total factor productivity, so that even periods of catch-up to the European average in the last 50 years were driven by capital deepening rather than productivity increases. Reis (2011) performs a developing accounting exercise on income per capita in 2000, to conclude that half of the gap to the incomes of Spain, Germany or the US is due to TFP, with the other half due to low schooling.

- The rapid increase in the size of the government, following the democratic revolution. Portugal was under IMF programs in 1977-78 and in 1983, and there was extensive hiring in the public sector during the 1980s and 1990s (Carreira, 2011).

- A rigid labor market with high costs of firing. Blanchard and Portugal (2001) note that while the unemployment rate in Portugal and the United States was on average the same in 1985-2000, the flow of workers through the labor market in Portugal was three times lower.

- An inefficient legal system with long judicial delays. Djankov et al. (2003) estimated that it took 441 days to collect a check returned for nonpayment in Portuguese courts,

compared to 234 on their sample of 109 countries, and 272 days among countries with a French legal system.

- The inability to compete in world trade markets following the entry of low-cost competition in the 1990s from Eastern Europe and China.

All of these factors are surely important to understand Portugal's average level of development and income relative to other countries in Europe over the last 40 years. More disappointingly, discussions of the slump since 2000 often start from the same list of facts. This risks confusing levels and changes. Ultimately, it is not an answer for what caused Portugal to slump starting in 2000, instead of some other year, when all of these hindrances to growth were still present. In the particular case of education, the years after 2000 were of some progress in closing the gap, with large investments in education raising the average years of schooling from 6.8 in 2000 to 7.7 in 2010, while scores in the PISA mathematics and science assessments increased markedly between 2000 and 2009 (from 454 and 459 to 487 and 493). In section 2.7, I will also argue that the Portuguese labor market is more flexible today than before.

The account that follows focuses instead on the period of the slump. Together with the early account in Blanchard (2007), the collected articles in Franco (2009), Lains (2009), and Alexandre et al. (2012), and the policy summary in IMF (2013) provide an overview of some of the facts of the Portuguese economy during this period. The goal of this section is to provide a narrative for what happened in Portugal, that both suggests a driving reason for the slump and questions some alternatives.

2.1 The dismal macroeconomic performance

Table 1 shows the level of some main economic indicators in 2007. The description of the sources for all of the data in the paper is in the appendix. Portugal was a rich country,

Table 1: Macroeconomic performance 2000-07

	2007 level	Growth/change 2000-07	Relative to the Euro-area	Relative to main trade partners
Real GDP per capita	€ 15,961	4.32	-5.41	-7.08
Real consumption per capita	€ 10,429	7.50	0.69	-2.70
Unemployment rate	8.9%	4.40	5.30	6.01
Real compensation per employee		2.70	0.80	3.35
Interest rate on 10-year bonds	4.42	-1.17	-0.04	-0.03

but the poorest of the twelve countries that composed the Eurozone between 2000 and 2007. The unemployment rate was 8.9%, the highest value in the country since 1960 with the exception of 1985, when it reached 9.1%. Almost half of that unemployment rate was generated between 2000 and 2007.

Real GDP per capita grew by a meager 4.3% during this period, for a 0.6% annual growth rate. At the same time, consumption grew at a faster rate than output, and real wages increased in spite of the rising unemployment. The numbers for both variables though, while positive, are far from being large. Portugal went through a slump, and consumers and workers bore the consequences.

The last two columns of the table compare these growth rates with those in two comparison groups: the euro-area and a weighted average of Spain (50%), Germany (30%) and France (20%).[1] These three countries accounted for approximately half of all Portuguese exports and imports, with the relative weights in Portuguese trade in brackets. Growth during this period in the Euro area was more than twice as high as in Portugal, and Portugal's trading partners grew by a full 1% more every year during this time. While unemployment was rising in Portugal, it was falling all over Europe.

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[1]For most of the tables, Euro-area refers to its original 12 members: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal and Spain. In some cases though, numbers were available for the euro-area 15, which also includes Malta, Cyprus and Slovenia. Because these three countries account for well under 1% of the GDP of the eurozone, the numbers for EA12 and EA15 are almost identical for the indicators that I use in this paper.

Using these comparison groups, the moderate wage growth in Portugal was higher than elsewhere. Again though, note that the relative increase is not large. It is common in debates about Europe to point to the increase in unit labor costs in Portugal relative to Germany being above 20% during this period, and then imply that Portuguese wages grew at a very fast rate. This statistic is misleading for two reasons. First, during this period, real wages fell significantly in Germany, but this was not representative of the euro-area or of Portugal's other trading partners. Second, most of the increase in relative unit labor costs comes because output per worker barely changed during in Portugal during those 7 years, whereas it grew significantly everywhere else in Europe, and especially in Germany. As Blanchard (2007) emphasized, adjusting wages to productivity would have required falling real wages throughout this period, which as Schmitt-Grohe and Uribe (2011) note, is a rare occurrence in advanced economies.

During these seven years, Portugal benefitted from a large reduction in long-term interest rates, in line with what happened all over the Euro-area. It is open to debate to what extent this was due to the removal of exchange-rate risk premia, or to unrealistically low expectations of default risk, but it is likely that both payed some role. The other side of the coin of this decline in interest rates, was the flow of capital from abroad.

2.2 One shock: capital flowing from abroad

Table 2 shows Balance of Payments statistics in 2007, and their evolution in the previous seven years. In 2007, Portugal owed foreigners €165 billion, approximately the whole of its GDP for that year. Most of this debt was accumulated during the slump; if one goes further back to the mid 1990s, Portugal's net foreign debt was close to zero. The period of the slump was also the period of an enormous influx of capital into Portugal, one of the largest the country has ever experienced.

It would be tempting to conclude that, given the slump, the Portuguese were borrowing

Table 2: Capital flows and trade in goods and services

	Percentage of GDP in 2007
Net foreign assets	-97.5
Change in NFA 00-07	-75.8
Cumulative Current Account	-49.3
Cumulative Trade Balance	-44.9
Cumulative Trade Balance ex-EU	-0.02

abroad to sustain a normal growth rate of consumption in the reasonable expectation that growth would resume shortly. Yet, not only did these expectations not materialize (at least yet), but as we saw in table 1, consumption was also stagnant, albeit not by as much as GDP. Moreover, large capital inflows were also going into Greece, Ireland and Spain, which did boom during 2000-07. As Lane (2012a) describes, during this period, there were large capital flows from some Northern Europe countries, especially Germany, towards the countries that later were in crisis. The large inflow of capital is not a Portuguese, but a Euro-area phenomenon.

Taking the perspective of Portugal, the other rows in the table break down the sources of the accumulation of debt to foreigners. The change in net foreign assets is equal to the cumulative current account balances plus valuation effects on prior net assets. The current account balance in turn equals the trade balance of goods and services, plus transfers from abroad, of which the main item are remittances from emigrants. Finally, we can separate Portuguese exports and imports into those within the European Union and those outside.

The table shows that the lion share of the borrowing from abroad came through trade deficits with the European Union; trade with outside of the EU matters was close to balanced. The pace at which this happened is remarkable, especially since Portugal is not particularly open for a country of its size: exports plus imports as a ratio of GDP were 72% in 2007.

During these years, the capital inflows were such that Portugal was receiving one-third more goods and services from abroad than it was giving back.

A second important source of the deterioration in net foreign assets is adverse valuation effects. Again though, this was a common occurrence across Europe during this decade especially vis-a-vis the United States (Lane and Milesi-Ferretti, 2007). It does not seem to be specific to the crisis. More particular to Portugal, emigrant remittances, a traditional source of revenue for the country in the past, played almost no role during the slump. Since the democratic revolution and especially with membership of the European Union, Portugal gradually became a net recipient of migrants, from Brazil, the former colonies in Africa, and Eastern Europe. Moreover, as standards of living increased in the country, the Portuguese emigrants abroad gradually stopped sending resources back home.

2.3 Competitiveness and the shift to nontradables

As Calvo, Leiderman and Reinhart (1996) documented for Latin American economies in the 1990s, large capital inflows typically come with increases in the real exchange rate. The real exchange rate is the ratio of the prices of goods at home and abroad, expressed on domestic currency. Table 3 shows its evolution and that of other relative prices for the Portuguese economy during the slump. The table reports the real exchange rate calculated by the OECD using the CPI as the measure of inflation and weighting each other country by their relative trade share with Portugal. The real exchange rate appreciated by almost 12%.

One hypothesis for the Portuguese slump is that Portugal set its exchange rate too high when entering the euro. If this was the case, then we would expect the real exchange rate to have depreciated back to its equilibrium level. Yet, not only the real exchange rate appreciated during the slump, but it it still above its 2000 level. Perhaps there is some truth to this hypothesis, but the data suggest that, at least, some other factor must have been at play.

Table 3: Changes in relative prices

	All trading partners	Euro-area	Main trading partners
Real exchange rate	11.91	5.98	4.01
Nominal exchange rate	7.70	0	0
Terms of Trade	1.33	1.70	-5.74
Relative price of non-tradables	10.58	4.28	9.74
Price of all industries	8.81	10.71	-0.77
Price of manufacturing		2.41	-4.22

While a 12% real appreciation is a large number, the second row of the table shows that a change of 7.7% is due to the appreciation of the nominal exchange rate.[2] While most of the Portuguese trade deficit occurred within the Euro-area, the largest driver of the change in the real exchange was the appreciation of the euro relative to the British pound and the American dollar. The other columns confirm this, by calculating the real exchange rate relative to the euro-area and the three main trading partners, using consumer price indices. Vis-a-vis these trading partners, the appreciation is considerably smaller.

If Portugal had its own currency and an independent monetary policy, it seems likely that the large current account deficits would have been offset by an equilibrating depreciation of the currency reducing the extent of the capital inflows. But, with most of the capital flows coming from the euro-area, and the euro appreciating in value given the current account surplus of the area as a whole, the exchange rate mechanism was at best inoperative, and at worst enhanced the capital flows.

The next two rows of Table 3 show a standard decomposition of the change in the real exchange rate into the sum of the change in the terms of trade and the change in the relative price of nontradables.[3] The terms of trade with respect to all trading partners are measured

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[2]Letting Q be the real exchange rate and E denote the nominal exchange rate such that an increase means an appreciation, then $Q = EP/P^*$ where P and P^* abroad, respectively.

[3]Letting α denote the weight of non-tradables in the price index, and assuming for simplicity that this

by Eurostat, while for the euro-area and the main trading partners, I use the relative price deflators of the manufacturing sector to proxy for tradables. These decompositions show that most of the change in the real exchange rate is due to an increase in the relative price of Portuguese nontradables.

Another hypothesis often repeated for the Portuguese slump is that the entrance of China in the World Trade Organization in 2001 provided a fierce competitor for Portuguese exports, which specialized in exploring Portugal's low wages relative to the European Union. While the growth of China in world markets has left no country unaffected, there are a few reasons to be skeptical of the Chinese ascent as a trade explanation for the Portuguese slump. First, the terms of trade barely deteriorated during this period. Second, while the export share of Portugal in world market declined, the change was almost the same as the one for Spain, Greece or Italy. Third, it is not clear why Chinese competition would cause a slump in distant Portugal, when so many other middle-income countries in Southeast Asia and Latin America boomed during this time, when they also exported goods in sectors with low wages, which were likely closer substitutes to the Chinese exports than the Portuguese goods.

A more promising avenue to explore is what is behind the increase in the relative price of non-tradables. There are two caveats to measuring this relative price as a residual. First, there are well-known large measurement difficulties with separating terms of trade and real exchange rates, so that estimating the price of non-tradables as the ratio of the two can be very imprecise. Second, there are large input-output links between tradables and non-tradables in every economy, so that using gross price deflators does not allow for a proper separation between the relative prices of the two sector. The last two rows of Table 3 provide an alternative by using instead measures of value added.

The increase in the relative value-added price across all industries is lower for all trading

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is constant and the same in the country and abroad, then $Q = E(P_T/P_T^*)(P_N/P_N^*)^\alpha$ where P_T and P_N are the price indices for tradables and non-tradables, respectively. The terms of trade are defined as $E(P_T/P_t^*)$.

partners, but higher for the Euro-area. Relative to its main trading partners, there is actually a depreciation, driven by the large increase in prices in Spain. More to the point, taking again manufacturing as a proxy for the tradable sector, it is clear that most of the change in relative prices is due to an increase in the relative price of nontradables.

One could potentially explain the increase in prices in Portugal relative the Euro-area average by appealing to the Balassa-Samuelson effect: as Portugal converges in income, productivity in the tradables sector would grow, which would raise wages and the price of non-tradables. Estrada, Gali and Lopez-Salido (2013) argue that this effect can explain little of the inflation differential in the Euro-area. In the case of Portugal, there was no convergence in income to the Euro-area during the slump, nor any significant productivity growth in the tradables sector, so the starting point for this explanation is difficult to justify.

2.4   The mis-allocation of resources across sectors

Table 4 turns to the shares of the tradable and non-tradable sectors in the economy to further investigate the consequences of the change in their relative price. The first two rows show the weight of manufacturing in employment and nominal value added in the Eurostat data. There is a clear decline in the weight of manufacturing. Coupled with the decrease in its relative price, this observation leads IMF (2013), following Bento (2004), to point to the growth of non-tradables as a main feature of the slump.

This is correct, but the facts are somewhat more nuanced. All over the advanced economies, manufacturing has been declining for a few decades as employment shift towards services. As table 4 shows, the fall in manufacturing employment turns out to only be slightly more pronounced in Portugal than in the rest of the Euro-area during this period. Moreover, because the relative price of manufacturing has been falling, this can lead to the sectors share in nominal output to fall, even if in real terms there is little decline.

To investigate these issues, I use the KLEMS database in the bottom section of the table

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Table 4: Changes in the weight of nontradables

	2007 level	Change 2000-07	Relative to the Euro-area	Relative to main trading partners
Shares in total economy				
Manufacturing employment	16.41	-3.06	-0.73	0.21
Manufacturing value-added	14.06	-3.00	-1.11	-0.81
Shares in industry				
Employment				
manufacturing	17.74	-2.72	-0.47	-0.31
construction	10.22	-1.33	-1.56	-2.11
real estate	6.38	0.96	-0.98	-0.90
community services	24.06	1.12	0.22	0.45
wholesale and retail trade	17.42	1.95	2.11	2.24
Value Added				
manufacturing	14.43	-2.66	-1.60	-0.40
construction	6.61	-1.00	-1.39	-2.91
real estate	14.59	0.14	-1.07	-2.23
community services	26.51	2.53	2.58	2.58
wholesale and retail trade	12.85	-0.52	0.13	0.10

to calculate shares in employment and in real value added, not just for manufacturing, but also for the other five largest sectors, all of which are dominated by non-traded products. The change is now for the period 2000-06 as data for 2007 is not available. A unique feature of the Portuguese economy, relative to the other euro-crisis countries, stands out: the construction sector declined significantly, both relative to other European countries as well as in absolute terms. Whereas in Spain, the share of real value added in construction rose from 8.3% to 12.2%, in Portugal it fell from 7.6% to 6.6%. At the same time, there were quite large increases in employment in wholesale and retail trade, and in the real output of community services, particularly in education, health and social work.

A marking feature of the slump in Portugal, but also of the boom in the other Euro-crisis countries, is the growth in the non-tradables sector, as emphasized by Giavazzi and Spaventa (2010). But this pattern was uneven across different sectors, and Portugal stands out for the expansion of wholesale and retail trade and community services, while construction and real estate actually contracted both in absolute and relative terms.

Two conventional inputs into macroeconomic models are the level of productivity and the extent of competition in the economy. A long literature has measured the first using Solow's total factor productivity, and the second using the log of the inverse labor share. Table 5 shows these measures, first for the overall economy using the Eurostat figures, and then for individual industries using the careful growth accounting exercises in the KLEMS project.

Productivity declined during these 7 years, and the falls were widespread across all industries. Notably though, they were larger in real estate and in wholesale and retail trade. Therefore, the industry that grew the fastest during the slump was also the one that had one of the worst performances in terms of productivity. At the same point, while markups fell across industries, they rose in one sector: community services. Therefore, the two sectors that expanded during the slump were the sectors where productivity was falling and/or

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Table 5: Productivity and markups

	Growth/change 2000-07	Relative to the Euro-area	Relative to main trading partners
Total economy			
Total Factor Productivity	-0.19	-3.31	-1.77
Log inverse labor share	-3.38	0.24	2.57
TFP in industries			
Total	-8.92	-9.30	-7.87
manufacturing	-3.99	-8.67	-7.32
construction	-11.72	-8.76	-8.08
real estate	-20.32	-16.59	-15.82
community services	-8.56	-7.59	-6.20
wholesale and retail trade	-13.96	-15.66	-13.31
Markups in industries			
Total	-0.02	-2.47	-4.92
manufacturing	-3.50	-7.14	-6.55
construction	-5.56	-12.87	-14.72
real estate	-2.93	5.91	-1.17
community services	3.50	2.57	1.00
wholesale and retail trade	-8.51	-8.65	-8.70

markup were rising. This suggests a mis-allocation of the resources coming into the country, going to unproductive sectors and sectors where rents are higher.

2.5 More evidence of misallocation

The mis-allocation of resources should not be unique to the capital inflows past 2000, but be a steady salient feature of the Portuguese economy. There is some evidence that it is so.

Braguinsky, Branstetter and Regateiro (2011) estimate the size distribution of Portuguese firms from 1980 to 2009. They find first that this distribution is quite skewed to the left, pronouncedly more than in Denmark or the United States. Portugal has many very small firms, even as productivity tends to be be higher in medium to higher sized firms.

Moreover, Braguinsky, Branstetter and Regateiro (2011) find a pronounced shift to the left in the distribution, unlike any other country. Changes in data coverage of the informal sector, or the shift to services can account, at best, for half of the shift. Instead, they argue that thresholds in labor law impose large taxes on large relative to small firms encouraging an inefficiently low equilibrium firm size.

Bloom and Van Reenen (2007)) produce cross-sectional distributions of management practices across firms for different countries. The estimates for Portugal show a strong left tail of firms that appear to be very poorly managed and unproductive, but somehow remain in operation year after year.

2.6 The other shock: taxes and old age pensions

The sector of community services that was just identified as growing is heavily supplied by the government. At the same time, having already discussed monetary policy, productivity and markup, fiscal policy is the remainder of the large usual shocks that can account for crises. Table 6 shows the evolution of the main fiscal variables during the slump.

Table 6: Government taxes, spending, and retirement policies

	2007 level	Change 2000-07	Relative to the Euro-area	Relative to main trading partners
Debt / GDP	68.3	17.9	20.8	26.6
Taxes / GDP				
Total	32.8	1.7	2.6	1.1
Consumption	12.6	0.8	1.2	1.3
Labor	12.4	0.9	2.1	1.4
Capital	7.8	-0.1	-0.7	-1.5
Government spending / GDP				
Total	44.4	2.7	2.9	3.0
Purchases	19.8	0.9	0.6	0.4
Social Protection	15.3	3.3	3.6	3.5
Old age	9.3	3.2	N/A	3.2
Old-age pension statistics				
Share population >65	17.3	1.2	-0.4	0.1
Pensioners / Labor Force	59.0	3.4		
Effective Retirement Age	66.3	2.5	N/A	2.0

Debt to GDP rose substantially during the seven years of the slump, especially relative to the other countries in Europe. In this regard, Portugal is close to Greece during this period. However, unlike Greece, this increase in public debt comes during a period of economic stagnation and rapidly rising unemployment. It would be surprising if debt had not increased. For comparison, in the United States in the four years since 2008, the unemployment rate increased by less than during the Portuguese great slump while federal debt held by the public relative to GDP increased by twice as much.

The data on the components of the deficit confirms this impression. Contrary to fiscal profligacy, taxes increased significantly during this period, both over consumption and labor income. While the euro area was significantly cutting taxes, especially on labor, Portugal was raising them through successive hikes during this period. The deficit was driven by an

increase in government spending, but as has become the norm in developed countries (Oh and Reis, 2012), little of it was due to discretionary purchases. In turn, the decline in interest rates ensured that while debt was growing, interest payments were roughly constant during this period. The bulk of the increase in spending that led to the rise in debt was in social transfers.

Here also, it is difficult to see signs of large discretionary spending in the data. In fact, in education, culture, or economic affairs, there were cuts in spending during the slump. More than 100% of the increase in total spending comes from a particular sub-category of social protection spending: old age retirement. The bottom section of table 6 shows some statistics relevant for retirement. Population is aging in Portugal but not at a faster rate than in other European countries, and the retirement age actually increased by 2.5 years during the slump, which is two years above what happened in Portugal's main trading partners. If the abnormal increase in spending was not due to significantly more retirees, then it must have been because of an increase in the generosity of pensions.

During the slump years there was no increase in the rules governing the generosity of pensions. In 2000 and 2002, pension reforms revised downwards the formula to link earnings to pensions, modestly reducing the replacement rates of the system. At the end of 2007, Portugal implemented a large reform of the pensions system so that now the retirement age is indexed to life expectancy, and the net replacement rate for a median worker is 73% (OECD, 2009). Previous to the reform, the system's generosity impacted spending through two specific channels. First, Portugal has one of the highest rates of old-age poverty in the OECD (OECD, 2009), and addresses this social concern by having a minimum pension for everyone. The combination of population aging and the slump implied large increased the spending in this anti-poverty aspect of Social Security. Second, the large expansions in the generosity of the system occurred in the early 1990s, especially for public servants. It was during the years of 2000-07 that these past promises came due, and spending rose.

Looking at the government, therefore, the more promising shock to explain the slump is the hike in taxes. This was mostly due to the need to keep up with a large increase in spending as a result of the slump or of past promises towards pensions. Portugal set up its welfare state in the early 1990s, and a very generous one that placed a large strain on public finances ten years later. Only by 2007 was there a serious reform of the system and by then taxes had been rising continuous to keep up.

I expressed skepticism that discretionary spending was a significant contributor: it is difficult to find evidence for much of it in the aggregate data. Looking at finer disaggregation across individual programs may show otherwise. However, the main example usually offered is the adoption of a minimum income program in the early 2000s, yet this program has a marginal weight on public finances. Alternatively, the public debate in Portugal was dominated by claims that the outsourcing of public contracts to private companies through public-private partnerships with onerous terms for the State was a huge burden on public finance. Yet, there is little hard evidence to back these claims, and most of the supposed negative impact of the PPPs should come in the future.

The absence of fiscal profligacy should not serve to exempt the Portuguese management of public finances. An earlier reforms of pensions, other cuts in spending programs, and less distortionary tax increases would have been more effective ways to deal with the old-age pensions problem, and may have prevented the slump.

2.7   The Portuguese labor market today is not that rigid today

A common mantra about the Portuguese labor market is its high rigidity. In the OECD measures of employment protection in 2000, Portugal scored 3.67 when the OECD average was 2, ranking Portugal as the second most rigid labor market over the 28 countries covered by the OECD measures. Beyond high restrictions on firing, the unemployment insurance system was very generous. In an influential paper, Blanchard and Portugal (2001) estimated

very low quarterly rates of job creation and destruction in Portugal between 1983 and 1995 and convincingly argued that these were due to high levels of employment protection.

However, there have been some significant changes since then. In terms of the law, Pereira (2012) documents the numerous reforms to the unemployment insurance system since 2000, all of which towards making it considerably less generous. Labor law made temporary contracts easier to sign and these have risen dramatically. In 2007, temporary employment was 22% of employment, against an EU-21 average of 15% and an OECD average of 12%. Focussing on the age group 15-24, which entered the labor market recently and so were not covered by outstanding permanent contracts, 52% are in temporary contracts against averages os 43% and 26% for the EU and OECD, respectively. Using detailed job flows data, Centeno and Novo (2012) estimate that between 2002 and 2006, 85% of all people leaving unemployment went into a temporary job, and that the share of fixed-term contracts was particularly large in firms expanding employment. During the slump, the marginal job in Portugal was a fixed-term contract.

These jobs were significantly less protected. The OECD's index of employment protection of temporary workers gives Portugal a score of 2.54 in 2008, close to the OECD average of 2.08, or 13th most protected out of 40 sampled countries. Alexandre et al. (2010) construct an index of labor-market flexibility that equally weights three standardized indicators: the share of workers not covered by some form of collective agreement, the share of workers without a full-time contract, and the share of workers earning above minimum wage within those with full-time working contract. Between 1999 and 2006, this index of flexibility more than doubles.

More relevant, Alexandre et al. (2010) estimate that between 2003 and 2009, the job turnover rate in fixed-term contracts was 44%, whereas the same statistic for permanent contracts was 19%. While job flows in Portugal are still not at the level of the United States, for the marginal job, the gap between worker flows in Portugal and the United States

is today significantly smaller than the earlier estimates of Blanchard and Portugal (2001). Centeno, Novo and Machado (2007) estimate that for 2001-07, the average quarterly rates for job creation and job destruction in Portugal 2001-07 were 5.3% and 5.1%, respectively, both 1.9% lower than for the United States during the same period. The annual job turnover rate in Portugal was 25.1%, very close to the U.S. level.

The Portuguese labor market since 2000 is a dual labor market (Centeno and Novo, 2012). Most jobs are still in a permanent contract and so are highly protected. This has an effect on *average* productivity, and may well be one of the crucial reasons behind Portugal's productivity and income gap to the rest of Europe. However, when it comes to explaining the slump, or more generally how the economy adjusts to macroeconomic shock, the relevant marginal worker in Portugal today is in a fixed-term contract, which is relatively flexible.

2.8   The take-away

In 2000-07, Portugal went through a slump in production and employment, in spite of large capital inflows and low long-term interest rates that modestly raised real wages and exchange rates. The relative price of most non-tradable sectors rose, yet the expansion in employment and value added was concentrated in wholesale and retail trade and in community services, while construction prominently contracted. Worryingly, wholesale and retail trade was also the sector with the largest relative decline in productivity and community services the sector with an increase in estimates of markups. This suggests that an explanation for the Portuguese slump was a large inflow of capital that was mis-allocated across sectors of the economy, causing an observed fall in the growth of productivity. At the same time, social security rules set up in the 1990s and earlier led to quickly rising spending on pensions, which were partly paid for by increasing taxes on labor income and consumption. These higher taxes depressed employment and ensured that in spite of the capital inflows, the economy went into a slump.

This account still leaves a few questions open. First, how are the resources misallocated and why did this happen in the 2000s in the nontradables sector? Second, how does the misallocation translate into measured low TFP? And third, what was special about Portugal that led it to experience a slump, while Greece, Ireland and Spain boomed during the same time period? To make progress in these, one needs a model that separately identifies some of these mechanisms, and spells out what assumptions are needed to make the account hold together. The next section takes on this challenge.

3 A model of mis-allocation of foreign capital inflows

The theoretical literature on sudden stops (e.g., Mendoza, 2006) has already spelled out the mechanism by which an increase in capital flows can lead to a reallocation from the tradables to the non-tradables sector. A fall in the interest rate at which a country can borrow from abroad causes a consumption boom and large capital inflows to finance it. The higher consumption of tradable is sustained through imports, whereas non-tradables must be produced domestically. This requires a reallocation of inputs into the non-tradable sector, and with it an increase in employment in that sector, an increase in real wages, and an appreciation of the real exchange rate. This description fits well the Portuguese slump, with one important exception: there was no boom in consumption or output.

Benigno and Fornaro (2012) introduce an additional mechanism. They assume that technology in the tradables sector improves via learning by doing, so that the reallocation of factors away from this sector, causes productivity growth to fall. This can account for the fall in measured TFP during the slump. However, productivity in the non-tradables in Portugal also stagnated, whereas their model would predict that it would be unchanged, or perhaps slightly accelerate if there is some learning-by-doing in this sector as well.

I present an alternative model that focuses on the mis-allocation of resources across

sectors, especially within non-tradables. I make simplifying assumptions that shut off the two mechanisms I just described, not because they are not important, but so that I can focus on the facts that they fail to explain. I anticipate that combining them would provide a working comprehensive model of the behavior of the Euro-criss countries in 2000-07.

I present the model in blocks. I start with a model of domestic credit market frictions that leads resources to be mis-allocated across firms, inspired by Aoki, Benigno and Kiyotaki (2010). Next, I present a model of capital inflows from abroad, that interacting with domestic frictions, can lower productivity. Aghion, Bacchetta and Banerjee (2004) and Caballero and Krishnamurthy (2001) are important precursors. Third, I present a simple model of labor supply to make the conventional case that higher taxes will depress economic activity. Fourth, I show that the low net worth of Portuguese entrepreneurs enhances the mis-allocation, but that as net worth improves, Portugal would leave the slump. Finally, I close the whole model by spelling out the allocation of inputs between tradable and non tradable sectors, in a way similar to Giavazzi and Spaventa (2010).

3.1 Credit markets and the mis-allocation of capital

An entrepreneur maximizes expected discounted utility:

$$\mathbb{E}\left[\sum_{t=0}^{\infty}\beta^t \ln(c_t)\right],$$

subject to an intertemporal budget constraint:

$$p_t c_t + k_t + \frac{d_{t+1}}{r_t} - \frac{b_{t+1}}{r_t^b} = p_t^N a_{t-1} k_{t-1}^\alpha n_t^{1-\alpha} + d_t - w_t n_t - b_t.$$

The left-hand side has consumption, bought at price p_t, investment in capital that will be productive next period k_t, investment in a financial institution d_{t+1} with return r_t, and

borrowing to finance production at rate r_t^b. On the right hand-side is the revenue from production using a Cobb-Douglas production function, that combines labor n_t and capital to generate a non-tradable good that sells for price p_t^N. With this revenue plus whatever financial investments she made, the entrepreneur must pay her workers and her financiers from last period. Capital fully depreciates after one period. To make the words borrowing and investing substantive, the following constraints hold: $d_{t+1} \geq 0, b_{t+1} \geq 0, k_t \geq 0$.

There is a continuum of these entrepreneurs, indexed by their productivity a_t. Every period, each entrepreneur draws a productivity from the distribution $G(a)$ in the interval $[0, \bar{a}]$. For simplicity, I assume these draws are i.i.d., and that they are the only source of uncertainty in the economy. Because all the entrepreneurs produce the same good, if financial markets were perfect then only the most productive of them would be in business. She would borrow in financial markets to invest in the optimal amount of capital, and next period hire workers to produce taking the price of the good as given. All others would save in financial markets since, as I will show later, in equilibrium $r_t \geq r_t^b$ always. Total factor productivity would be $\bar{a}$.

However, this economy has financial frictions, which I model through a collateral constraint. Each entrepreneur can only pledge an amount θ of the future revenue after paying wages to collateralize its loans:

$$b_t \leq \theta \left[p_t^N a_{t-1} k_{t-1}^\alpha n_t^{1-\alpha} - w_t n_t. \right]$$

If θ was above α this constraint would not bind. The entrepreneurs could borrow at least the amount of optimal capital payments and the market would be efficient. I assume instead that $\theta \leq \alpha$. More strongly, backed by the discussion in the previous section, I assume that Portugal has a particularly underdeveloped capital market, such that θ is quite close to zero.

To be clear, in the model the parameter θ stands in for a general misallocation of resources

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across firms, within and across sub-sectors of non tradable good, that prevents the most efficient firms from growing in size. In the model, this maps more directly into limitations on credit, and I will use that language throughout. But it could also refer to government regulations, inefficiency of the judicial system, or the cartelization of sectors by a few large economic groups with privileged access to protection from regulators and policymakers.

The appendix fully characterizes the optimal behavior of each entrepreneur, while here I focus on three key results that follow from it. First, defining:

$$x_{t-1} = \left(\alpha^{\frac{\alpha}{1-\alpha}} - \alpha^{\frac{1}{1-\alpha}}\right) \left(\frac{p_t^N a_{t-1}}{w_t}\right)^{\frac{\alpha}{1-\alpha}}$$

then the optimal mix of inputs implies that revenue after taxes is equal to $x_{t-1}k_{t-1}$. Therefore x_{t-1} captures the return at date t from investing a unit of capital at date $t-1$. Because productivity is the only source of uncertainty, the entrepreneurs and potential financiers know x_{t-1} when they make their investment, so this is a safe return, but they face a menu of such returns. With a slight abuse of notation, I will refer to x_t as the adjusted productivity of the entrepreneur, and capture its distribution by $G_t(x_{t-1})$, indexed by t to emphasize that times when p_t^N/w_t is higher first-order stochastically dominate times when it is lower.

Second, defining z_t as the net worth of the entrepreneur, then the budget constraint can be written as $z_{t+1} = R(x_t)(z_t - p_t c_t)$ where the return on savings is equal to:

$$R(x_t) = \max\left\{r_t, \frac{(1-\theta)x_t}{1 - \frac{\theta x_t}{r_t^b}}\right\}$$

Entrepreneurs therefore sort themselves into two groups. Those with low productivity, choose $k_t = 0$ and use their net worth to invest in financial assets, earning r_t on their net worth. Those with productivity x_t such that $R(x_t) \geq r_t$, produce and borrow all the way to make their constraint bind, earning a leveraged return that is above x_t.

Economies with under-developed financial makers therefore suffer from two inefficiencies in their production. On the extensive margin, many inefficient firms are in operation. Letting a_t^* denote the threshold above which entrepreneurs go into business, with under-developed financial markets $a_t^* < \bar{a}$. On the intensive margin, the most efficient entrepreneur produces below the efficient scale since she can only borrow up to a multiple of her net worth.

This simple model of capital mis-allocation can capture the relevant features of the Portuguese economy highlighted in section 2. There are many small firms, most of which are very unproductive. Because the country is still accumulating capital in its convergence process, net worth of entrepreneurs is small, and the production of the most efficient firms will be severely curtailed. Finally, average firm-level TFP in the economy is $\int_{a_t^*}^{\bar{a}} a_t dG(a_t) / [1 - G(a_t^*)]$, which increases with a^*. Therefore, financial under-development that causes a^* to fall will lead to low measured productivity.

3.2 Capital inflows and the expansion of nontradables

Because of the assumption of log preferences, the entrepreneurs consume a constant fraction $1 - \beta$ of their net worth every period. Net worth therefore evolves according to $z_{t+1} = \beta R(x_t) z_t$. Since the net worth of active entrepreneurs is, by definition, equal to $(1 - \theta) x_t k_t$, it follows that the loan to entrepreneurs with productivity x_t it equal to:

$$b_{t+1} = \theta x_t k_t = \frac{\theta \beta R(x_t) z_t}{1 - \theta}$$

These loans come from a competitive financial sector. This sector is the only that can make loans because it is the only one that can seize collateral from the entrepreneurs. We can think of the collateral parameter θ as their technology, so that underdeveloped credit markets are synonymous with an inefficient financial sector.

The sources of funds to the financial sector are two-fold. First, it collects investments

from inactive entrepreneurs in the total amount $D_{t+1} = \int_0^{a_t^*} d_{t+1} dG(a_t)$. Second, it borrows from abroad at rate r^*. Banks have a second technology that allows them to transform non-tradable seized collateral into tradable output at transformation rate $\phi \in (0,1)$. Therefore, they can receive capital inflows from abroad, F_{t+1}, up to a fraction ϕ of their loans B_{t+1}. The parameter ϕ measures the integration of the country in capital markets. I assume that ϕ is not so high so that in equilibrium the constraint always binds: $r_t^b > r^*$.

The profits of the financial sector are $B_{t+1} - F_{t+1} - D_{t+1}$ and their budget constraint is:

$$\frac{D_{t+1}}{r_t} = \frac{B_{t+1}}{r_t^b} - \frac{F_{t+1}}{r^*}.$$

Finally, the constraint on borrowing from abroad is $F_{t+1} \leq \phi B_{t+1}$ and the limit on lending domestically is $B_{t+1} \leq \theta x_t K_t$. The solution to this problem is straightforward. From the zero-profit condition, the rate of return charged on loans is:

$$\frac{1}{r_t^b} = \frac{\phi}{r^*} + \frac{1 - \phi}{r_t}.$$

As long as $\phi < 1$, we can see that $r_t > r_t^b$ as I assumed earlier. Combining this relation between interest rates with the condition determining which entrepreneurs are active, we obtain the equilibrium relation:

$$r_t = \frac{(1 - \theta) x_t^*}{1 - \frac{\theta \phi x_t^*}{r^*} - \frac{\theta (1 - \phi) x_t^*}{r_t}}$$

This gives an upward-sloping relation between r_t and x_t^*, denoted in figure 2 by the operations-threshold curve. Intuitively, a higher return to financial savings implies that more entrepreneur will choose to be inactive and make their net worth available to the financial sector instead of operating a firm.

In equilibrium, deposits finance a share $1 - \phi$ of loans. The market clearing condition in

Figure 2: Equilibrium with non-tradables and lending markets

Operations–threshold

Market–clearing

r

x
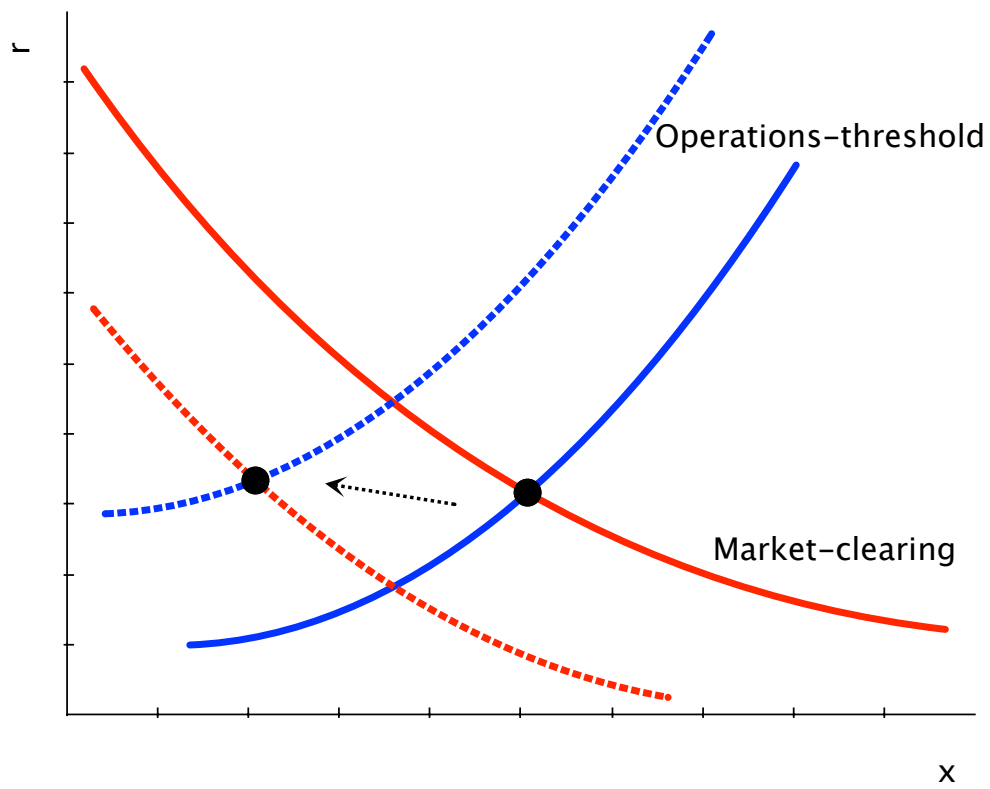
the financial market therefore is:

$$\frac{(1-\theta)r_t}{\theta(1-\phi)} = \frac{\int_{x_t^*}^{\bar{x}_t} R(x_t)dG_t(x)}{G_t(x_t^*)}.$$

This gives a downward-sloping relation between r_t and x_t^*, denoted in figure 2 by the market-clearing line. Intuitively, if fewer firms are financed, then fewer loans are made so the demand for deposits is lower. In equilibrium, the deposit rate falls. The intersection of the two schedules gives the unique equilibrium for x_t^* and r_t.

The introduction of the euro removed exchange-rate risk for European investors. Moreover, in its main refinancing operations, the ECB started accepting as collateral bonds of many Portuguese public companies, providing a new source of funds. More generally, the monetary union actively promoted the integration of capital markets in Europe. Therefore, I take the capital inflow shock to correspond to an increase in ϕ.

A higher ϕ shifts both schedules to the left. It leads to an unambiguous fall in x^*. With capital market integration, foreigners are more willing to supply funds to the economy. Because they do not have expertise in the local market, they must channel their investments through the financial system. Yet, because the domestic credit market is underdeveloped, banks are unwilling to extend credit to existing productive firms, which are already operating against their collateral constraint. Instead, the new funds flow into starting new inefficient firms, enhancing the mis-allocation of capital in the economy.

Applied to Portugal after 2000, this model says that when the capital from the rest of Europe flew into Portugal, it led to the expansion of the non-tradable sector. Many inefficient firms could now obtain financing, so they went into business. Domestic savings fell, and funds flowed from abroad. Measured TFP fell. In fact, in the sectors were the expansion was larger, TFP fell the most, since more unproductive firms entered the market. While Portuguese banks were able to access financing from abroad, the domestic financial

sector did not significantly improve in its ability to allocate capital. The parameter θ was unchanged. Therefore, the most productive firms were unable to access the new abundant funds and expand production. Almost all of the increase in the output of non-tradables came from the expansion into less productive firms.

3.3   Labor, wages and taxes

Aside from the entrepreneurs, the model economy also has a representative household, who supplies labor and operates the competitive tradable technology. His preferences are:

$$\sum_{t=0}^{\infty} \beta^t \ln \left(C_t - \frac{N_t^{1+\phi}}{1+\phi} \right).$$

Labor income is taxed at rate τ, with the proceeds rebated to the household every period. I abstract from government debt, because this model is Ricardian, and I do not include government purchases because section 2 concluded they were not important. Distortionary taxes on workers to fund transfers to pensioners was where the action was in the data. The labor supply function then is:

$$N_t^{\phi} = (1 - \tau) w_t.$$

The household can produce tradables using the technology:

$$Y^T = K_{t-1}^{T(1-\alpha)} N_t^{T\alpha}$$

Because the whole of the post-wage output can be pleadable to foreigners, the household can borrow to finance production of this good. The tradable technology therefore operates efficiently and as a result the familiar Cobb-Douglas zero-profit condition holds:

$$r^* w_t^{\frac{\alpha}{1-\alpha}} = \alpha^{\frac{\alpha}{1-\alpha}} - \alpha^{\frac{1}{1-\alpha}}$$

From here, it follows that real wages are completely pinned down by the foreign interest rate. Therefore, so is labor supply.

Combining the labor market clearing condition with the optimal labor demand for tradables gives the condition:

$$K_{t-1}^T + K_{t-1}^N = \alpha^{\frac{1}{\alpha-1}} w_t^{1/\phi + 1/(1-\alpha)} (1-\tau)^{1/\phi},$$

where $K_t^N = \int_{x_t^*}^{\bar{x}_t} k_t dG_{t+1} x_t$ is the capital employed in the non-tradable sector.

The increase in the number of tradables produced following the integration of European capital markets expands K_t^N. This equation shows that, all else equal, K_t^T must contract. The non-tradable sector absorbs labor to operate alongside the new capital and this causes the tradable sector to shrink relative to it.

At the same time, the Portuguese government continuously raised taxes. This discouraged labor supply lowering the right-hand side of the labor market-clearing condition. In turn, this lowered capital and output in both sectors, all else equal. Because θ is small, and the domestic credit market is very inefficient, this effect is enough to mostly offset the increase in output from the entry of unproductive firms into the non-tradable sector. As a result, total output stagnated and employment fell.

3.4 The evolution of net worth and the level of capital

I assume that $\beta < 1/r^*$. The household will therefore run through his savings to the point where he borrows the whole amount needed to produce tradables. His consumption reduces to $w_t L_t$ every period.

As for the entrepreneurs, aggregating over the law of motion for their net worth gives:

$$\beta \left[r_t + \int_0^{\bar{x}_t} \left(R(x_t) - r_t \right) dG_t(x_t) \right] Z_t.$$

In turn, aggregating over the collateral constraint of the active entrepreneurs gives the total capital employed in that sector:

$$K_t^N = \left(\frac{\beta Z_t}{1-\theta}\right) \int_{x_t^*}^{\bar{x}_t} \left(\frac{R(x_t)}{x_t}\right) dG_t(x_t)$$

Portugal is one of poorest countries in the Euro area. Net worth (Z_t) is low, and so the collateral constraint binds inducing a low level of capital in the non-tradable sector (K_t^N). When the capital from abroad flowed in, it expanded the number of firms, but it did not lead to an appreciable increase in the production of the existing more productive firms, which were already against their collateral constraint. With time, as capital accumulates, the non-tradable sector would keep on growing and eventually the economy as a whole would pick up, as resources start to move away from unproductive towards more the productive non-tradable firms.

3.5 Closing the model and other countries

I assume that the consumption basket is a Cobb-Douglas aggregator of the tradable and the non-tradable good with weight δ. Normalizing the price of the tradable to 1, then the optimal consumption of the two varieties ensures that the following condition holds:

$$p_t^N = \left(\frac{\theta}{1-\theta}\right) \frac{C_t^T}{Y_t^N}$$

Finally, market clearing for tradable goods gives the evolution of the current account:

$$\frac{F_{t+1}}{r^*} - F_t = C_t^T + K_t^N - wN_t.$$

This closes the model which has a single state variable Z_t and a recursive equilibrium. The model was successful at matching most of the features of the data for the Portuguese

slump. Its crucial ingredients were the misallocation of the capital inflows, channeled into unproductive non-tradable firms, and the fall in labor supply because of the increase in taxes.

A successful model of the Portuguese slump must also be able to account for what was happening in Greece, Ireland and Spain at the same time. These economies are sufficiently similar in their structure, and in 2000-07 all of them experienced large capital inflows, an expansion of non-tradables, real exchange rate appreciation, and decline sin productivity growth. However, unlike Portugal, they all boomed during these years.

Relative to Ireland and Spain though, Portugal has a less developed financial system, and jousting form the cross-sectional distribution of productivity and management practices across firms, likely also more mis-allocation of capital. In the model, this would be captured by a higher θ. Ireland and Spain would then have a higher starting x^*, so they would be more productive than the Portuguese economy to start with, and have more efficient firms operating at a larger scale. When the capital market integrates with the euro and ϕ increases, there is a larger increase in the capital employed by the more efficient firms, and a smaller rate of entry of unproductive firms. Output in the non-tradables sector booms, at the expense of the tradable sector. Together with cuts in taxes during these, especially pronounced in Ireland, the economy as a whole goes through a strong boom.

4   The Portuguese crash, 2010-present

In 2008-09, most advanced countries were in a recession, so it is difficult to separate the global shock from Portugal's crisis. If anything, the Portuguese economy showed signs of recovery. Not only the fall in GDP was not as large as that of the Euro-zone, but also exports started booming.

In January of 2010 though, interest rates on long-term Portuguese government bonds started rising, a few months after the same had happened in Greece. Between 2003 and

2009, interest rates on 10-year bonds had hovered between 3.2% and 5.0%, but during 2010 they rose from 3.9% to 6.5%. Public spending also rose markedly as the government, which had won re-election in September of 2009, implemented a campaign promise of raising public-sector awakes after years of zero increases. By the end of March of 2011, 10-year interest rates were at 7.8% and banks reported serious difficulties rolling over their international funding. The prime-minister asked for external assistance, and a troika of the IMF, the European Commission and the ECB approved a memorandum of understanding with the Portuguese government in May in exchange for a rescue loan. The government resigned, and elections in June led to a change in the party in power. Only by January of 2013 did the 10-year interest rate fall below 7% again.

There are a few accounts of the dynamics of the euro-crisis, and Portugal fits well into most of them (see Lane, 2012b, Brunnermeier et al., 2011, Shambaugh, 2012, and Obstfeld, 2013). Instead, in this brief section I will point to some of key facts that confirm the prevailing narrative, and then discuss how existing theories can account for the events and who to merge them with the model of the previous section.

4.1 The crash

Figure 3 shows what happened to capital flows. Starting with the value of the net intentional investment position in December 2008, I plot the accumulated current account. The net foreign debt has been stable since the start of 2010. For most of that year, it was positive valuation effect that offset the current account deficit, but by the end of 2012 was almost in a situation of surplus. During this time, the large flows from the monetary authorities, via Target 2 balances, and via the government, including the troika loans, have played a key role. They have substituted for the private flows that left the country in mass from the middle of 2011 onwards. This exodus of private capital flows is comparable to the deep crises in Latin America in the last two decades.

Figure 3: The sudden stop of private capital flows
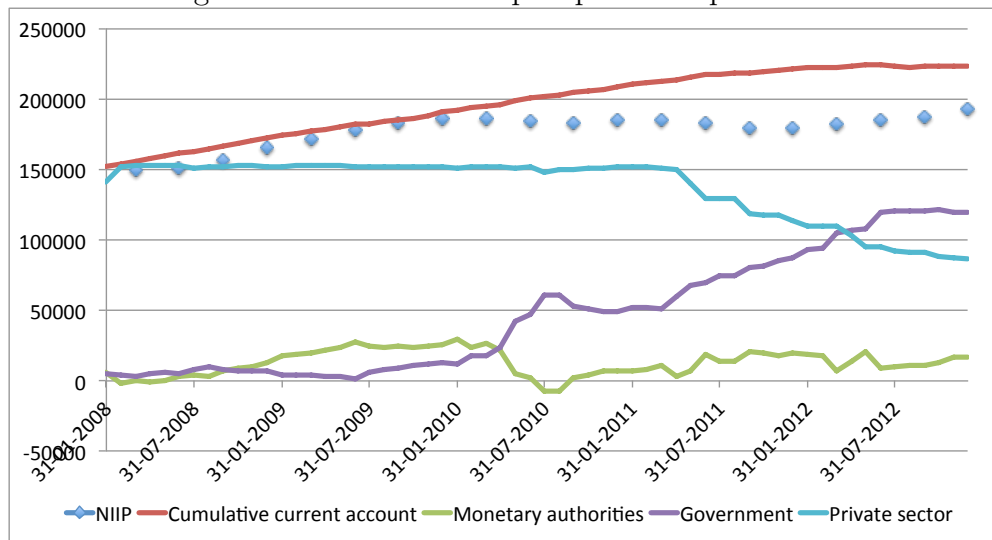
One of the most affected sectors were banks. In 2010, they accounted for almost half of the country's net foreign debt. Most of the inflow of funds to Portugal during the slump came through debt instruments, with the banking sector being the main intermediary. As part of the troika package, three out of the four largest banks have been recapitalized with public funds.

There are two characteristics of Portuguese banks that are shared with other European banks, but which are quite different from their American counterparts. First, Portuguese banks are very large relative to the size of the country. In 2007, the three largest banks, BCP, BES and BPI, had assets over GDP of 67%, 52% and 31%, respectively. As a result, in case of a severe banking crisis, the ability of the already revenue-strapped government to rescue the banks is seriously in question. Second, Portuguese banks hold a large amount of Portuguese government securities. In the December 2010 European Banking Authority stress tests, the exposure of Portuguese banks to the Portuguese government was estimated at 23%. As a result of these features, sovereigns and banks in Europe are joined at the hip: the correlation between CDS spreads for sovereigns and banks is close to one (Mody and Sandri, 2012).

Figure 4: Public finances during the crash
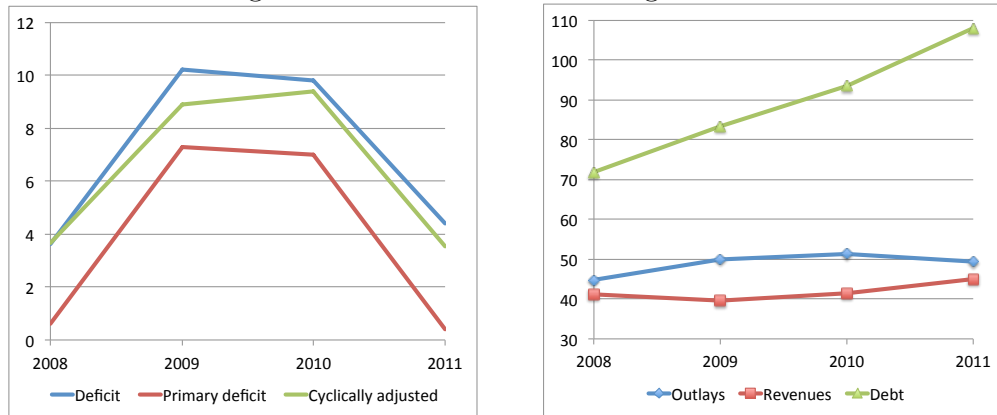
Turning to public finances, figure 4.1 shows the evolution of the aggregate categories of spending and the stock of debt. In 2011, there was a serious consolidation of public finances, with the first reduction in the ratio of spending to GDP in the last 20 years. The deficit after cyclical adjustments was 4% and the public accounts were almost in balance. Still, relative to the targets in the initial memorandum of understanding, public debt is higher than the objective.

Finally, turning to structural reform, the memorandum of understanding with the troika listed 223 separate reforms to undertake with regards to the functioning of most areas of government intervention. The five reviews of the program so far have agreed that the government has implemented most of them on schedule. As a striking example, in the OECD employment protection index, Portugal was the second highest in 2000, 7th highest by 2009, and with all the implemented reforms, it is forecasted to be 13th spot in 2012 (IMF, 2013). Yet, growth continues to be dismal and the forecast for the next two years are grim. The unemployment rate in the fourth quarter of 2012 was 16.9%.

4.2 Modeling the crash

One way to consider the shock that led to the crash is that r^* unexpectedly rose. Risk premia rose in most asset classes around the world, and in the case of Europe, in light of the financial instability, it is plausibly rational to increase the probability of default on sovereign bonds. This shock is similar to the financial integration shock that I considered in the previous section, but it leads to a contraction in both tradable and non-tradable sectors.

Interacting with this shock were the three main features of the Euro-crisis that also applied to Portugal and which the previous section emphasized. First, given the large increase in unemployment we would expect to see a large decline in wages. Yet, since the beginning of 2010, average nominal compensation per employee has fallen by less than 2%, and unit labor costs by 4-6%. In spite of the deep crisis and the remarkable increase in unemployment, there are strong nominal wage rigidities. An example is illustrative: employment in the construction sector fell by 170,000 workers between 2006 and 2012 so a third of all jobs were destroyed on net. Yet, nominal wages in the sector are fixed by collective bargaining and still have not fallen a single cent.

Schmitt-Grohe and Uribe (2011) model this wage rigidity by replacing the assumption that the labor market clear with a condition that the real wage cannot fall by more than inflation, otherwise labor is determined labor demand. In terms of our model this would consist of dropping the equation for labor supply if it implies that wages fall. Otherwise, most of the mechanism that they describe, whereby the sudden stop leads to a deep and prolonged recession and a jobless recovery would remain.

Second, as Obstfeld (2013) emphasizes the euro crisis is at its heart a financial crisis. Brunnermeier et al. (2011) argue that the sudden panics and run-ups in sovereign bond yields in Portugal and elsewhere were the consequence of a diabolic loop between banks and sovereigns. Fears about the solvency of a sovereign put the bank's solvency at risk since they hold so much of their assets in sovereign debts. But if the bank fails this will increase

government net spending either directly because of the need for a bailout, or indirectly because of the possibly recessionary impact of a banking crisis. Either way, the initial fears are confirmed, and the economy may easily fall into having multiple equilibrium.

Reis (2013) puts forward a simple model of this mechanism. It could also be easily merged with the setup above, by making two modifications. First, the financial sector would be required to hold government bonds of at least a fraction of the loans it makes. If the government accommodates this demand, then the model can also explain the run-up in government debt that we observed in Portugal, through a demand-side channel: the financial liberalization needed safe assets and the government supplied them. Second, there is a maximum to the amount of tax revenue that can be extracted and Portugal was probably close to it by 2007, and the government can transfer funds to banks. The diabolic loop will then be at work. If the government defaults on its bonds, banks need an injection of funds, which lowers the fiscal surplus and makes it more likely that the only way for the government to satisfy its intertemporal budget constraint is to default.

A third ingredient is the role of the fiscal austerity. Much ink has been spilled over, on the one hand, the need for a country suffering a run on its debt to have a credible plan to lower its public deficits, while on the other hand, fiscal austerity prolonging recessions. In principle, it would be easy to introduce this dilemma into the model, using one of the many models in the literature on fiscal consolidations.

5 Conclusion

The events in the Portuguese economy since 2000 have been fascinating. Like many countries before it, Portugal went through a sharp increase in capital inflows from 2000 onwards. Whereas these led to a boom elsewhere, in Portugal they triggered a slump. I argued that this was due to two factors. First, underdeveloped credit markets in Portugal implied that

most of the capital inflows went to fund unproductive firms in the non-tradable sector. This causes productivity to fall and the real exchange rate to appreciate, and it took resources away from the tradables sector. Second, because of generous past promises on old age pensions, the Portuguese government continuously raised taxes between 2000 and 2007. This discouraged work, and combined with the mis-allocation of resources, produced a slump. I also suggested that some of the capital was used to sustain an increase in consumption over output and that productivity in the tradables sector could have suffered because of reduced learning by doing, as has been suggested in the literature.

A growing recent literature has looked at the potential for mis-allocation of capital to be the source for the large income differences that we observe across countries (e.g., Hsieh and Klenow, 2009). I suggest in this article that the same mechanisms may also be behind great slumps, like the one experienced by the Portuguese economy. Future work might be able to test whether relative poverty and propensity for slumps are related, through the economic mechanisms that this literature suggests. In the case of Portugal, future work can also look for more evidence that mis-allocation is stronger in the race and community services sectors, as I proposed in this article.

After the slump, and two years of global recession, the Portuguese economy left 2009 with a large stock of debt, both public but especially external. Exports were rising and growth was on or above Euro-area average, so there were signs that the process of net worth accumulation plus the extensive labor market and social security reforms might be emerging from its slump. The worldwide financial crisis then hit Portugal at the worst time. The increase in risk premium led to a sudden stop of capital inflows, and the need for fiscal austerity caused taxes to be raised even further. In turn, downward nominal wage rigidity prolonged the downturn in employment, while the diabolic look between sovereigns and banks generated self-fulfilling runs on the public debt. How Portugal will emerge from this shock remains to be seen.

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Appendix

A   Data sources

The data used to characterize the 2000-07 slump comes mainly from two sources: Eurostat, especially through the AMECO database, and the OECD Economic Outlook. For the crash 2010-, I use the more recent data from the Banco de Portugal, Instituto Nacional de Estatistica, and the PORDATA database. More details available form the authors.

B   More details on the model

There are three types agents: entrepreneurs, banks, and households.

B.1   Entrepreneurs' problem

A continuum of entrepreneurs, with density $G(a)$ solve the problem:

$$\max \mathbb{E}\left[\sum_{t=0}^{\infty} \beta^t \ln(c_t)\right] \text{ subject to:} \tag{1}$$

$$p_t c_t + k_t + \frac{d_{t+1}}{r_t} - \frac{b_{t+1}}{r_t^b} = p_t^N a_{t-1} k_{t-1}^{\alpha} n_t^{1-\alpha} + d_t - w_t n_t - b_t, \tag{2}$$

$$b_t \leq \theta \left[p_t^N a_{t-1} k_{t-1}^{\alpha} n_t^{1-\alpha} - w_t n_t \right], \tag{3}$$

$$d_{t+1} \geq 0, \;\; b_{t+1} \geq 0, \;\; k_t \geq 0. \tag{4}$$

We can start by solving the production decision. Solving for the choice of n_t that maxi-

mizes revenue, we obtain that

$$p_t^N a_{t-1} k_{t-1}^\alpha n_t^{1-\alpha} = x_{t-1} k_{t-1} \tag{5}$$

$$\text{where: } x_{t-1} = \left(\alpha^{\frac{\alpha}{1-\alpha}} - \alpha^{\frac{1}{1-\alpha}} \right) \left(\frac{p_t^N a_{t-1}}{w_t} \right)^{\frac{\alpha}{1-\alpha}}. \tag{6}$$

Then, if x_t is higher than r_t^b it follows that the collateral constraint will bind, and we can replace it into the budget constraint to obtain:

$$z_t = x_{t-1} k_{t-1} + d_t - b_t \tag{7}$$

$$z_{t+1} = R(x_t)(z_t - p_t c_t) \tag{8}$$

$$R(x_t) = \max \left\{ r_t, \frac{(1-\theta)x_t}{1 - \frac{\theta x_t}{r_t^b}} \right\} \tag{9}$$

Remember that $r_t > r_t^b$ in equilibrium. If the first term in the maximand is higher, then $k_t = b_{t-1} = 0$, and $z_t = d_t$ so the entrepreneur invests all his funds in the financial market. Otherwise, $d_t = 0$, the collateral constraint binds so $b_{t+1} = \theta x_t k_t$ and investment is constrained by net worth: $x_t k_t = z_{t+1}/(1-\theta)$. The threshold x_t^* is the solution to:

$$r_t = \frac{(1-\theta)x_t}{1 - \frac{\theta x_t^*}{r_t^b}} \tag{10}$$

Turning to the consumption problem, it becomes:

$$\max \mathbb{E} \left[\sum_{t=0}^\infty \beta^t \ln(c_t) \right] \text{ subject to:} \tag{11}$$

$$z_{t+1} = R(x_t)(z_t - p_t c_t) \text{ and } z_t \geq 0 \tag{12}$$

This is a standard problem with solution: $p_t c_t = (1-\beta)z_t$ and $z_{t+1} = R(x_t)\beta z_t$.

B.2 Banks' problem

A representative bank solves the problem:

$$\max B_{t+1} - F_{t+1} - D_{t+1} \text{ subject to:} \tag{13}$$

$$\frac{D_{t+1}}{r_t} = \frac{B_{t+1}}{r_t^b} - \frac{F_{t+1}}{r^*}, \tag{14}$$

$$F_{t+1} \leq \phi B_{t+1}, \tag{15}$$

$$B_{t+1} \leq \theta x_t K_t, \tag{16}$$

$$D_{t+1} \geq 0 \ \ B_{t+1} \geq 0 \ \ F_{t+1} \geq 0. \tag{17}$$

The bank takes the interest rates as given. In equilibrium, they must ensure that there are zero profits so:

$$\frac{1}{r_t^b} = \frac{\phi}{r^*} + \frac{1-\phi}{r_t}. \tag{18}$$

Because of the assumption that r^* is low enough that it is always below r_t^b, it follows that $r_t > r_t^b$ as I imposed on the entrepreneur problem. Using this equation to replace out r_t^b in equation 10 gives the *operations-threshold curve*:

$$r_t = \frac{(1-\theta)x_t^*}{1 - \frac{\theta\phi x_t^*}{r^*} - \frac{\theta(1-\phi)x_t^*}{r_t}} \tag{19}$$

The two constraints hold as equalities, giving the supply of banks loans as: $B_{t+1} = \theta x_t K_t$ Integrating over all operating firms, using the fact that x_t is i.i.d across firms, and letting $\bar{Z}_t$ denote verge net worth among all entrepreneurs, we get:

$$B_{t+1} = \frac{\theta \beta R(x_t)\bar{Z}_t}{1-\theta} \tag{20}$$

Deposits in turn are equal to the integrated net worth of all inactive entrepreneurs:

$$D_{t+1} = \int_0^{a_t^*} d_{t+1} dG(a_t) \tag{21}$$

$$= \int_0^{x_t^*} z_{t+1} dG_{t+1}(x_t) \tag{22}$$

$$= \bar{Z}_t G_{t+1}(x_t^*) \tag{23}$$

Finally, noting that deposits finance a share $1 - \phi$ of all loans, then combining equations 20 and 23 gives:

$$\frac{(1-\theta)r_t}{\theta(1-\phi)} = \frac{\int_{x_t^*}^{\bar{x}_t} R(x_t) dG_{t+1}(x)}{G_{t+1}(x_t^*)}. \tag{24}$$

This is the *market clearing* line.

B.3   Households

A representative household solves:

$$\max \sum_{t=0}^{\infty} \beta^t \ln \left(C_t - \frac{N_t^{1+\phi}}{1+\phi} \right) \tag{25}$$

$$p_t C_t + K_t^T - \frac{F_{t+1}^T}{r_t^*} = Y^T - w_t N_t^T - F_t^T + (1-\tau)w_t N_t + T_t, \tag{26}$$

$$Y^T = K_{t-1}^{T(1-\alpha)} N_t^{T\alpha}, \tag{27}$$

$$F_t^T \leq Y^T - w_t N_t^T. \tag{28}$$

The solution is standard. Because I assume that $\beta < 1/r^*$, the borrowing constraint will bind so the optimality conditions, combined with the zero-profit condition for tradables and

the government budget constraint $\tau w_t N_t = T_t$:

$$p_t C_t = w_t N_t, \tag{29}$$

$$N_t^\phi = (1 - \tau) w_t, \tag{30}$$

$$r^* w_t^{\frac{\alpha}{1-\alpha}} = \alpha^{\frac{\alpha}{1-\alpha}} - \alpha^{\frac{1}{1-\alpha}}. \tag{31}$$

B.4   Market clearing for labor and tradables

The labor market clearing condition is:

$$N_t = N_t^T + \int_{a*_{t-1}}^1 n_t dG(a) \tag{32}$$

Combining the labor demand from the two types of firms, with the labor supply from the household and rearranging, we have:

$$K_{t-1}^T + K_{t-1}^N = \alpha^{\frac{1}{\alpha-1}} w_t^{1/\phi+1/(1-\alpha)} (1 - \tau)^{1/\phi} \tag{33}$$

Aggregating over the collateral constraint of the active entrepreneurs gives the total capital employed in that sector:

$$K_t^N = \left(\frac{\beta Z_t}{1-\theta}\right) \int_{x_t^*}^{\bar{x}_t} \left(\frac{R(x_t)}{x_t}\right) dG_t(x_t) \tag{34}$$

The market clearing for tradable goods gives the evolution of the current account:

$$\frac{F_{t+1}}{r^*} - F_t = C_t^T + K_t^N - w N_t. \tag{35}$$

Replacing in the solutions for all of the terms on the right-hand side, we get an equation for

the price of the non-tradable:

$$p_t^N = \left(\frac{\theta}{1-\theta}\right)\frac{C_t^T}{Y_t^N} \tag{36}$$

$$= xxx \tag{37}$$

Finally, aggregating over the law of motion for the net worth of all the entrepreneurs gives:

$$Z_{t+1} = \beta\left[r_t + \int_0^{\bar{x}_t}(R(x_t) - r_t)\,dG_t(x_t)\right]Z_t. \tag{38}$$

B.5 Equilibrium

The set of equation above gives a solution for all of the variables as function of a single state variable Z_t. *To expand*