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The Portuguese Slump and Crash and the Euro Crisis

ABSTRACT Between 2000 and 2012, the Portuguese economy grew less than the United States during the Great Depression and less than Japan during its lost decade. This paper asks why this happened, with a particular focus on the slump between 2000 and 2007. It describes the main facts of Portugal's recent economic history, evaluates some possible explanations for its dismal performance, and proposes a new hypothesis based on the misallocation of abundant capital flows from abroad. I put forward a model of credit frictions to show that if financial integration exceeds financial deepening, productivity will fall, generating a slump as relatively unproductive firms in the non-tradables sector expand at the expense of more productive tradables firms. This explanation can also potentially account for the similarities and the differences between Portugal on the one hand, and Ireland and Spain on the other, during this period, and for some features of the crash in Portugal after 2010.

Writing 10 years after the introduction of the European common currency, the vice president of the European Central Bank, Lucas Papademos, stated unequivocally that "the euro has been a resounding success" (Papademos 2009, p. 16). The euro was by then a reserve currency, and inflation was stable and on target. Economic growth in the euro area had not fallen relative to the previous two decades, and employment had increased significantly, while capital markets had become more integrated, and southern Europe had benefited from sustained low interest rates. Papademos (2009) 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.

Yet even before the global 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 the attention of economists and policymakers in a notable article by Olivier Blanchard

(2007). Portugal, Blanchard observed, had been in a slump since 2000, with anemic productivity, almost no economic growth, and increasing unemployment. At the same time, wages had been rising and the country's competitiveness falling, and both the government and the country's private sector were accumulating debt at a rapid pace. Most, but not all, of the same issues were also present in Greece, Ireland, and Spain, but did not seem so pressing since their economies were growing and, with the exception of Greece, fiscal consolidation was under way.

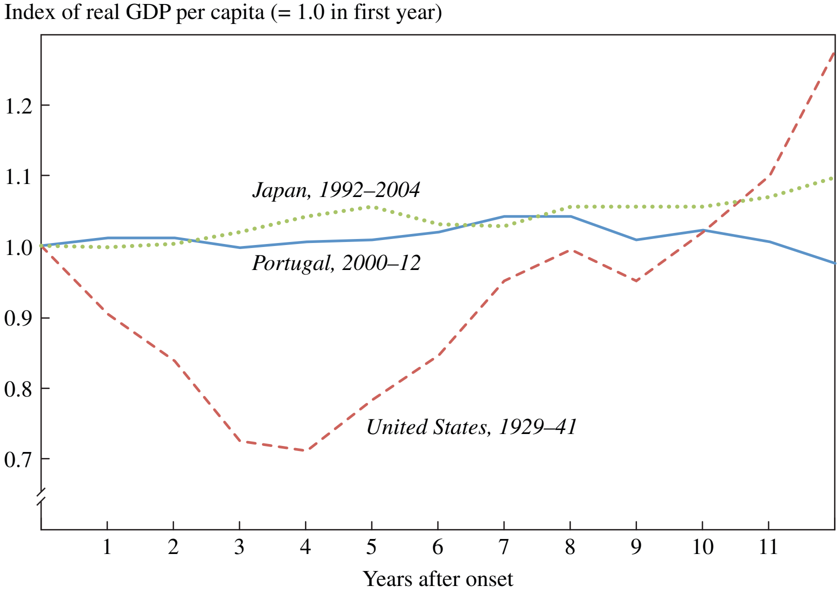
Many dismissed these alarm signs at the time. Portugal's extensive borrowing from abroad could be justified as borrowing against expected future growth, as the Portuguese economy converged with the European core. Or perhaps Portugal was becoming the Florida of Europe, to which wealthy northern Europeans were sending their capital in the expectation of migrating for their retirement. The Portuguese slump was greeted with recommendations for structural reforms that are as often repeated as they are sterile—the constant verdict on the country regardless of the state of its economy.

The severity and extent of the crisis that has affected so many European countries since 2009 dismiss this complacency. Understanding what has been happening in Europe—and the European periphery in particular—is one of the great challenges facing macroeconomists today (Shambaugh 2012). Portugal in the 2000s experienced neither a housing boom like Spain and Ireland, nor as rampant an increase in public debt as Greece, nor does it suffer from Italy's chronic political instability. Yet since 2010 all five countries have been in a similar state of crisis. Because Portugal was one of the first countries where the symptoms were identified, it is a good place to look for clues on what is behind the crisis.

There are a few more reasons why understanding what has happened to the Portuguese economy since 2000 is of interest. First, economic growth has been as bad as it gets for a developed economy. Figure 1 shows real GDP per capita in Portugal since 2000, along with the same measure for the United States from 1929 to 1941 and Japan from 1992 to 2004. Although Portugal never went through as steep a contraction as did the United States in the 1930s, its population today is poorer, relative to the start of the slump, than Americans were at the end of the Great Depression or the Japanese after their lost decade. These extreme periods of dismal economic performance offer an opportunity to learn about the mechanisms that drive the macroeconomy, beyond the obvious potential for improving welfare.

Second, in the postwar era before 2000, Portugal gradually integrated with the rest of Europe, and the milestones in this process came during

Figure 1. Lost Decades: Portugal, Japan, and the United States



Sources: See appendix A.

periods when Portugal was one of the fastest-growing countries in the world. Income per capita doubled in the decade after 1960, when Portugal joined the European Free Trade Association. The years after joining the European Community in 1986 were likewise marked by great progress. Yet the advent of European monetary union marked the beginning of Portugal's prolonged slump. Understanding the difference between these episodes should yield lessons on the benefits and costs of economic integration.

Third, the main features of the crisis bear a remarkable similarity to the well-documented history of capital inflows and sudden stops in Latin America in the past 20 years (Calvo, Leiderman, and Reinhart 1996), and to the crisis in the Nordic countries in the early 1990s. The events in the euro crisis provide a new testing ground for our understanding of capital account liberalization (Henry 2007), sudden stops (Calvo 1998), and currency unions (Schmitt-Grohé and Uribe 2011). In spite of the similarities, Portugal's slump in 2000–07, following a mild boom in 1995–2000 and followed by a crash after 2008, is a distinctively new phenomenon relative to these previous instances of sudden stops. Understanding the slump may thus provide valuable hints about the mechanisms through which large and sudden capital inflows may have harmful effects, and what can policy do about them.

As important as it is, explaining the Portuguese economy since 2000 is not easy. Why did Portugal receive such large capital inflows? Why did they come even though productivity had 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, enjoy a boom at the same time? These are some of the questions this paper tries to answer.

Section I presents the key facts that make the recent behavior of the Portuguese economy both interesting and puzzling. Because Portugal did not experience a deep and rapid contraction, like that in the United States during the Great Depression, it is hard to identify any one sudden shock that triggered the events that followed. Portugal's experience is instead closer to that of Japan, with a prolonged period of little or no growth, and like Japan's experience it has generated competing hypotheses to explain it. Section I puts forward a narrative to explain the 2000–07 period, when the economy was barely growing in spite of large capital inflows. I propose that the Portuguese slump was the combined result of one major shock and one persistent feature of its economy: the large capital flows that came with the integration of capital markets that followed the euro, and the underdeveloped Portuguese financial market. I argue that the weakness of Portugal's financial sector caused the capital inflows to be largely misallocated, leading to an expansion in the country's relatively unproductive nontradables sector, and thus to a fall in measured productivity. On top of this, taxes were increased to meet past commitments to old-age pensions that had not been dealt with in timely fashion. Section I also critiques some proposed alternative causes for the slump, including trade shocks, discretionary fiscal spending, and rigid labor markets.

To further investigate this proposed explanation, section II presents a model of an open economy with two key ingredients. First, the economy comprises both a tradables and a nontradables sector. Second, credit is allocated to the nontradables sector through a banking system that collects funds domestically and from abroad, subject to collateral constraints. In the model, the shock that triggers the slump is the relaxation of the financing constraint on foreign capital; in the real world this can be interpreted as the introduction of the euro. Yet because the domestic credit market is underdeveloped, banks are unwilling to extend credit to existing productive firms, which are already operating at their collateral constraint. Instead the new funds flow into new, inefficient firms, worsening the misallocation of capital in the economy. The economy therefore slumps even as the real exchange rate strengthens and the nontradables sector expands.

A growing recent literature explores the role of capital misallocation in explaining why differences in income per capita persist across countries (see Restuccia and Rogerson 2013 for a survey). I suggest in this paper that the same mechanisms may also be behind major slumps at the medium-term, business-cycle frequency, like that experienced recently by the Portuguese economy. Future work might be able to test whether relative poverty and a propensity for slumps are related through the economic mechanisms that this literature suggests.

Section III explores the model further in three directions. First, it investigates whether the misallocation story can quantitatively account for the size of the slump. Second, it considers the predictions of the model for other countries, trying especially to understand the many similarities, but also the few differences, between Portugal and two other countries on the European periphery, Ireland and Spain. I suggest that, if one assumes that taxes had not risen and that 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. Third, the paper assesses the relative contributions of capital misallocation and the increase in taxes.

Section IV looks at the period before the slump, between 1995 and 2000 when the Portuguese economy boomed, and after the slump, especially the crash from 2010 onward. I present the main facts and interpret them in a way consistent with my account of 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 Portuguese evidence. Section V concludes.

I. The Portuguese Slump: Facts and a Narrative

The typical paper describing the weaknesses of the Portuguese economy invariably mentions the following:

—Portugal’s low average educational attainment, an inheritance of the dictatorship that ruled between 1933 and 1974 without making a serious investment in literacy or higher education. In Robert Barro and Jong-Wha Lee’s (2010) data set, average years of schooling for those aged above 25 was 4.1 in Portugal in 1975, compared with 8.9 in Ireland, 6.3 in Greece, and 5.7 in Italy. By 1995 these gaps had only barely been reduced.

—Portugal's low total factor productivity (TFP), which meant that even periods of catch-up to the European average in the last 50 years were driven by capital deepening rather than by productivity increases. Reis (2011) performs a development accounting exercise on Portugal's income per capita in 2000 and concludes that half of the gap relative to the incomes of Spain, Germany, or the United States is due to differences in TFP, with the other half due to low schooling.

—The rapid increase in the size of the government following the democratic revolution of 1974. Portugal had trouble controlling its public finances, and debt crises brought about International Monetary Fund (IMF) programs in 1977–78 and in 1983–85. The 1980s and 1990s saw extensive hiring in the public sector (Carreira 2011).

—The rigid labor market, with high costs of firing. Blanchard and Pedro Portugal (2001) note that although the unemployment rates in Portugal and in the United States were on average the same over 1985–2000, the flow of workers through the labor market as a proportion of employment in Portugal was about one-quarter as large.

—The inefficient legal system, with long judicial delays. Simeon Djankov and others (2003) estimate that it took 420 days to collect on a check returned for nonpayment in Portuguese courts, compared with 234 days on average in their sample of 109 countries, and 272 days among countries with a legal system based on the French model.

—The inability to compete in world trade markets because of specialization in low-wage and low-value-added goods, which were especially hurt by competition in the late 1990s from Eastern Europe and China.

All of these factors are surely important to an understanding of Portugal's level of development and income relative to other countries in Europe over the last 40 years. What is disappointing is that discussions of the slump since 2000 often start from the same list of facts. This risks confusing levels and changes. Ultimately, the facts listed above are not an answer for what caused Portugal to stop growing after 2000, instead of in some other year when all of these same hindrances to growth were also present.[1]

The account that follows focuses on the period of the slump. I proceed in the style of a narrative, describing the main features of the data in a way

1. Moreover, Portugal has seen structural reforms and progress, in spite of its poor economic performance. For instance, large investments in education in the 1990s raised average years of schooling from 6.8 in 2000 to 7.7 in 2010, and scores on the PISA (Program for International Student Assessment) mathematics and science assessments increased markedly, from 454 and 359, respectively, in 2000 to 487 and 493 in 2009.

Table 1. Selected Macroeconomic Indicators in Portugal and Its Trading Partners, 2000–07

		Growth rate or change, 2000–07		
Indicator	*Portugal, 2007*	*Portugal*	*Euro area*[a]	*Main trading partners*[b]
		Annualized growth rate (percent)		
Real GDP per capita	€15,961	0.61	1.34	1.55
Real consumption per capita	€10,429	1.04	0.95	1.38
Real consumption per employee		0.38	0.27	–0.10
		Change (percentage points)		
Unemployment rate	8.9%	4.40	–0.90	–1.61
Annual interest rate on 10-year government bonds	4.42%	–1.17	–1.13	–1.14

Sources: See appendix A.

a. The 12 countries that had adopted the euro as their currency by 2000.

b. Weighted average of Spain (50 percent), Germany (30 percent), and France (20 percent), which together account for roughly half of Portugal's exports and imports during 2000–07.

that suggests a compelling reason for the slump. In each of the following subsections, I also present alternative hypotheses that have been put forward, along with at least one salient feature of the data that casts doubt on these alternative accounts. The reader is referred to Blanchard (2007), the volumes edited by Francesco Franco (2009) and Pedro Lains (2009), Vitor Bento (2010b), Fernando Alexandre and others (2012), and IMF (2013) for alternative discussions of these hypotheses, which I sometimes defend in this paper, but sometimes also criticize.

I.A. Dismal Macroeconomic Performance

Table 1 shows the levels of some of Portugal's main economic indicators in 2007 and their changes from 2000 to 2007. (The sources for all of the data in the paper are listed in appendix A.) In 2000 Portugal was a rich country by world standards, but the poorest of the 12 countries that initially formed the euro area. From then through 2007, real GDP per capita grew by a meager 4.3 percent, for a 0.6 percent annual growth rate. Consumption grew faster than output during this period, and real wages increased in spite of rising unemployment. The unemployment rate in 2007 was 8.9 percent, the highest it had been since 1960 with the exception of 1985, and almost half of that unemployment rate was generated between 2000 and 2007. Portugal was going 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 as a whole, and a weighted average of Spain (50 percent), Germany (30 percent) and France (20 percent),[2] three countries that accounted for approximately half of all Portuguese exports and imports during this period. GDP growth during this period in the euro area, and among the countries that are Portugal's main trading partners, was more than twice as rapid as in Portugal. And while unemployment was rising in Portugal, it was falling elsewhere in Europe.

One explanation for the Portuguese slump argues that it was due to irresponsible wage growth in the country, rendering it uncompetitive in international markets and causing the rise in unemployment. The fact commonly cited to support this hypothesis is that unit labor costs in Portugal rose about 20 percent relative to those in Germany during this period. However, this statistic is misleading for two reasons. First, although during this period real wages fell significantly in Germany, this decline was not representative of the euro area as a whole or of Portugal's other trading partners. Second, most of the increase in relative unit labor costs was due not to rising wages in Portugal—as the table shows, Portuguese wages did not rise much faster than in the two comparison groups—but to the fact that output per worker barely changed in Portugal during those 7 years, whereas it grew significantly elsewhere in Europe. As Blanchard (2007) emphasizes, adjusting wages to productivity would have required falling real wages throughout this period, which, as Stephanie Schmitt-Grohé and Martin Uribe (2011) note, is a rare occurrence in developed economies.

The last row of the table shows the large reduction in long-term interest rates in Portugal during these 7 years, in line with what happened all over the euro area. It is open to debate to what extent this decline was due to the removal of the exchange rate risk premium with the adoption of the euro, or to unrealistically low expectations of default risk. Either way, it was associated with a flow of capital from abroad, which I discuss next.

I.B. The Shock: Capital Flowing from Abroad

Portugal owed foreigners €165 billion in 2007, an amount approximately equal to the whole of its GDP for that year (table 2). Most of this

2. In most of the tables, "euro area" refers to the original 12 participants in European monetary union (EA12): Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain. In some cases, however, data were available only for the euro area 15, which also includes Cyprus, Malta, and Slovenia. Because these three countries account for well under 1 percent of the GDP of the euro area, the numbers for the EA12 and the EA15 are almost identical for the indicators that I use in this paper.

Table 2. Selected Capital and Current Account Indicators in Portugal, 2000–07

Indicator	*Percent of 2007 GDP*
Capital account	
Stock of net foreign assets, 2007	–101.0
Change in net foreign assets, 2000–07	–78.5
Current account (cumulative)	
Current account balance, 2000–07	–51.0
Trade balance, 2000–07	–46.5
Trade balance ex-EU, 2000–07	–19.0

Sources: See appendix A.

debt was accumulated during the slump; if one goes further back, to the mid-1990s, Portugal's net foreign debt was close to zero. During the slump Portugal borrowed vast amounts from abroad, in one of the largest capital influxes the country has ever experienced.

One explanation for the slump would argue that productivity exogenously stopped growing temporarily during the early 2000s, explaining the fall in output, but was expected to grow faster in the future. In the meantime Portugal would borrow abroad to sustain a steady growth rate of consumption, in the reasonable expectation that growth would resume shortly. This demand-based explanation for the surge in Portuguese borrowing faces three problems. First, the expected future growth never materialized. Moreover, as table 1 showed, consumption was also stagnant, even if not as stagnant as GDP. Second, large capital inflows, coming mostly from Germany, were also going to Greece, Ireland, and Spain during these years (Lane 2013), even though these countries were booming. Third, the interest rate at which Portugal borrowed fell during this period. Rather than a shock to Portugal's demand for borrowing, these facts suggest a euro area–wide supply shock to capital.

The last three rows in table 2 break down the sources of the accumulation of foreign debt. The change in net foreign assets is by definition equal to the cumulative current account balance plus valuation effects on the initial stock of net assets. Adverse valuation effects are important during this period, although, as Philip Lane and Gian Maria Milesi-Ferretti (2007) document, they were common across Europe, especially vis-à-vis the United States. The current account balance in turn equals the balance of trade in goods and services, plus transfers from abroad, of which the main item is remittances from emigrants. Although this last item has traditionally been large for Portugal, it played almost no role during the slump.[3]

Finally, one can separate Portuguese exports and imports into those within the European Union and those outside. The table shows that most of the borrowing from abroad came through trade deficits with the rest of the European Union. The pace at which these deficits grew is remarkable, especially since Portugal is not particularly open for a country of its size: exports plus imports were 72 percent of GDP in 2007. During these years Portugal was receiving one-third more goods and services from abroad than it was sending in return.

Banks were at the center of these capital flows, serving as the intermediary between the foreigners and Portuguese firms and households. Ruo Chen, Milesi-Ferretti, and Thierry Tressel (2010) estimate that in 2007, banks accounted for approximately half of the Portuguese foreign debt. Categorizing gross capital flows into equity, foreign direct investment, and debt, Lane (2013) estimates that between 2003 and 2007, debt accounted for 68 percent of these flows.

I.C. Competitiveness and the Shift to Nontradables

As Guillermo Calvo and coauthors (1996) document for the Latin American economies in the 1990s, large capital inflows typically come with increases in the real exchange rate, that is, in the ratio of the prices of goods at home to those of goods abroad, expressed in domestic currency. Table 3 shows that Portugal's real exchange rate against all its trading partners as a group rose by almost 12 percent during the slump.

Another hypothesis for the slump is that on entering monetary union, Portugal set the exchange rate at which it traded escudos for euros at too high a value. This would explain the large trade deficit with the rest of the euro area, as Portuguese firms would then have had difficulty selling their overpriced goods abroad. If this were the case, however, the real exchange rate should have tended to fall back to its equilibrium level. Yet not only did the real exchange rate continue to rise during the slump, but it remains today above its 2000 level.

Moreover, as table 3 also shows, of Portugal's 11.9 percent real appreciation against all trading partners, 7.7 percentage points is due to a rise

3. After the democratic revolution and especially with membership in 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 home country, Portuguese emigrants abroad gradually stopped sending resources back home.

Table 3. Changes in Exchange Rates and Relative Prices between Portugal and Its Trading Partners, 2000–07

	Percent change, 2000–07, relative to		
Indicator	*All trading partners*	*Euro area*[a]	*Main trading partners*[a]
Nominal exchange rate	7.70	0	0
Real exchange rate[b]	11.91	5.98	4.01
Terms of trade	1.33	1.70	–5.74
Relative price of nontradables[c]	10.58	4.28	9.74
Value-added measures of prices[d]			
All industries	8.81[e]	10.71	–0.77
Manufacturing		2.41	–4.22

Sources: See appendix A.
a. See table 1 for the countries included.
b. Real exchange rates are calculated using the consumer price index as the measure of inflation.
c. Calculated as the residual.
d. Except as noted, all value-added measures are for the change from 2000 to 2006.
e. Change from 2000 to 2007.

in the nominal exchange rate.[4] Thus, even though most of the Portuguese trade deficit occurred in trade within the euro area, the largest driver of the change in Portugal's real exchange rate was the appreciation of the euro relative to other currencies, especially the British pound and the dollar. The other columns in the table confirm this, by calculating the change in Portugal's real exchange rate with the euro area and with Portugal's three main trading partners, all of which use the euro. Relative to these trading partners, Portugal's real appreciation has been modest.

Table 3 also shows 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 as the residual.[5] Most of the change in the real exchange rate was due to an increase in the relative price of Portuguese nontradables.

Yet another hypothesis for the Portuguese slump is that the accession of China to the World Trade Organization in 2001 introduced a

4. Let Q be the real exchange rate and E the nominal exchange rate, both defined such that an increase means an appreciation. Then $Q = EP/P,*$ where P and $P*$ are the price indexes at home and abroad, respectively.

5. Let γ denote the weight of nontradables in the price index, and assume for simplicity that this weight is constant and the same in the home country and abroad. Then $Q = E(P_T/P^*_T)^{1-\gamma}(P_N/P^*_N)^{\gamma}$, where P_T and P_N are the price indexes for tradables and nontradables, respectively. The terms of trade are defined as $E(P_T/P^*_T)$.

fierce competitor for Portuguese exports, one that, like Portugal, specialized in exploiting its low wages relative to the richer EU countries. Although the growing role of China in world markets has left no country unaffected, there are a few reasons to be skeptical of the Chinese ascent as providing a trade-based explanation for the Portuguese slump. First, as table 3 shows, Portugal's terms of trade deteriorated only slightly during this period. Second, although Portugal's export share in world markets declined, those of Spain, Greece, and Italy declined by almost the same amount, yet these countries avoided Portugal's slump. Third, it is not clear why Chinese competition would cause a slump in distant Portugal, at a time when so many other middle-income countries in Southeast Asia and Latin America were booming. These countries also exported goods in low-wage sectors, which were likely closer substitutes for Chinese exports than were Portuguese goods.

A more promising avenue to explore is what is behind the increase in the relative price of nontradables. There are two caveats to measuring this relative price as a residual. First, the difficulties in measuring both the real exchange rate and the terms of trade may translate into even greater inaccuracy in measuring their difference. Second, there are important input-output links between tradables and nontradables in every economy, so that using gross price deflators does not allow for a proper separation between the relative prices of the two sectors.

The last two rows of table 3 provide an alternative means of decomposition, by using instead measures of value added both for the whole economy and for manufacturing alone as a proxy for tradable goods. Relative to the country's main trading partners, the relative price of all goods in Portugal actually fell, mostly driven by a large increase in prices in Spain. More to the point, taking manufacturing as a proxy for the tradables sector, it is clear that the evidence for uncompetitive Portuguese tradables is slim, whereas the relative price of nontradables clearly increased against all benchmarks.

Is the increase in Portugal's prices relative to the euro area due to a Balassa-Samuelson effect, whereby as Portugal converges in income to the rest of Europe, productivity in the tradables sector grows, raising wages and the price of nontradables? Angel Estrada, Jordi Galí, and David Lopez-Salido (forthcoming) argue that this effect can explain little of the inflation differentials in the euro area. In the case of Portugal, there was no convergence in income to the euro area during the slump, nor was there any significant productivity growth in the tradables sector, so it is hard to justify the starting point for this explanation.

Table 4. Changes in Sector Composition in Portugal and Its Trading Partners, 2000–06

		Change, 2000–06 (percentage points)		
Indicator and sector	*Portugal, 2006*	*Portugal*	*Euro area*[a]	*Main trading partners*[a]
Share in employment				
Manufacturing	17.74	–2.72	–1.94	–2.14
Construction	10.22	–1.33	0.16	0.53
Real estate	6.38	0.96	1.40	1.39
Community and other services	24.06	1.12	1.07	0.94
Wholesale and retail trade	17.42	1.95	–0.14	–0.28
Share in value added				
Manufacturing	14.43	–2.66	–1.34	–2.23
Construction	6.61	–1.00	0.37	1.74
Real estate	14.59	0.14	0.75	1.91
Community and other services	26.51	2.53	0.11	0.06
Wholesale and retail trade	12.85	–0.52	–0.72	–0.63

Sources: See appendix A.
a. See table 1 for the countries included.

I.D. Growth and Decline by Sector

Table 4 turns to the shares of the tradables and nontradables sectors in the Portuguese economy, to further investigate the consequences of the change in their relative price. Starting with manufacturing's share in employment and nominal value added, the table shows their values in 2006, and the change in both shares from 2000 to 2006. There is a clear decline in both, which can be associated with a decline in the tradables sector and a corresponding increase in the nontradables sector. Indeed, growth in the nontradables sector is a distinctive feature not only of the slump in Portugal, but also of the boom in the other euro crisis countries (Bento 2010a, Giavazzi and Spaventa 2010).

However, manufacturing has been in relative decline for decades throughout the developed world as employment shifts toward services. As table 4 also shows, the fall in manufacturing employment turns out to be only slightly more pronounced in Portugal than in the rest of the euro area during this period. Moreover, because the relative price of manufactured goods has been falling, the decline in manufacturing's share in nominal output overstates the slight fall in its real share.

To dig deeper, the rest of the table shows the shares in employment and in value added not just for manufacturing, but also for the other four largest

Table 5. Changes in Productivity and in Markups in Portugal and Its Trading Partners, by Sector

Indicator and sector	*Portugal*	*Euro area*[a]	*Main trading partners*[a]
Total factor productivity	*Annualized growth rate, 2000–05 (percent)*		
All industries	–1.85	0.07	–0.21
Manufacturing	–0.81	0.92	0.63
Construction	–2.46	–0.60	–0.74
Real estate	–4.44	–0.76	–0.92
Community and other services	–1.77	–0.19	–0.48
Wholesale and retail trade	–2.96	0.34	–0.16
Markups[b]	*Average annual change, 2000–06 (percentage points)*		
All industries	0.00	0.39	0.84
Manufacturing	–0.58	0.31	0.35
Construction	–0.93	1.16	1.42
Real estate	–0.49	–1.02	0.10
Community and other services	0.58	0.11	0.29
Wholesale and retail trade	–1.42	0.01	0.13

Sources: See appendix A.

a. In the top panel, "euro area" includes only Austria, Belgium, Spain, Finland, France, Germany, Italy, and the Netherlands. In the bottom panel, "euro area" refers to the same 12 countries as in table 1.

b. The markup for each sector is defined as the negative of the log of the labor share.

sectors, all of which are dominated by nontraded products and services. 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 and in absolute terms. Whereas in Spain the share of value added in construction rose from 8.3 percent to 12.2 percent, in Portugal it fell from 7.6 percent to 6.6 percent. At the same time, Portugal saw quite large increases in employment in wholesale and retail trade and in the real output of community services, particularly in education, health care, and social work. Thus, the growth in nontradables was uneven across sectors.

I.E. Misallocation of Resources across Sectors

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 Robert Solow's concept of total factor productivity, and the second using the negative of the log of the labor income share. Table 5 shows the changes in these measures for Portugal, both for the overall economy and for the five largest sectors.

Productivity declined during the slump across all sectors. Notably, however, the decline was largest in real estate and in wholesale and retail trade. Thus, the sector where employment grew fastest during the slump, wholesale and retail trade, was also one of the worst performers in terms of productivity growth. At the same time, even as markups fell across most industries, they rose in one sector, community and other services, which had the second-fastest employment growth. This suggests a misallocation of the resources coming into the country, as the sectors that grew their employment the most either are relatively unproductive or have rising rents.

I.F. More Evidence of Misallocation

If the preceding discussion is correct, then the misallocation of resources should not be unique to the capital inflows since 2000 but should be a steady, salient feature of the Portuguese economy. There is some evidence that it is so.

Serguey Braguinsky, Lee Branstetter, and André Regateiro (2011) estimate the size distribution of Portuguese firms from 1986 to 2009. They find, first, that this distribution is quite skewed to the left, pronouncedly more than in, for example, Denmark or the United States. Portugal has many very small firms, even as productivity tends to be higher in medium-size and larger firms. Second, they find a pronounced shift to the left in the distribution throughout this period, unlike what is observed in 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, Braguinsky and coauthors argue, thresholds in labor law impose higher taxes on large than on small firms, encouraging an inefficiently low equilibrium firm size.

Nicholas Bloom and John Van Reenen (forthcoming) 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.

Eric Bartelsman, John Haltiwanger, and Stefano Scarpetta (2009) have put together a data set of firm-level productivity estimates for many sectors in many countries. It includes data on labor productivity for Portugal in the years 1991–94 and 2000, but they focus their analysis only on the early 1990s. Using their supplementary information, I took the cross-sectional average of their coefficients of variation of labor productivity across firms within a sector, weighted by firm size. The result is 0.017. The same calculation for Germany yields a result of 0.002. If one is willing to focus solely on manufacturing, one can also compare Portugal with France, another of its main trading partners. The average coefficient of variation for Portugal is 0.023, whereas for France it is 0.013. Using Bartelsman and others' (2009) publicly available data for 2000 in Portugal and Germany, I also calculated this statistic for two important nontradables sectors: construction, which was contracting in Portugal during the period, and retail trade, which was expanding. I also distinguish among existing firms, new entrants, and exiting firms. Across all categories, productivity in Portugal is considerably more dispersed than it is in Germany, and there is no clear pattern of the dispersion being higher just in the sector that was growing, or just among entering firms. All considered, this is suggestive evidence that there are many unproductive firms in operation in Portugal, which do not seem in danger of closing down.

I.G. The Government: Taxes and Old-Age Pensions

Having discussed monetary and exchange rate policy, productivity, and markups, I now turn to fiscal policy as another usual candidate to explain recessions and slumps. Table 6 shows the changes in the main fiscal variables over 2000–07.

Portugal's ratio of public debt to GDP rose substantially during the 7 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 in Greece, this increase in public debt came during a period of economic stagnation and rapidly rising unemployment. It would therefore be surprising if the debt had not increased. For comparison, in the United States in the 4 years since 2008, the unemployment rate increased by less than in Portugal during its slump, yet federal debt held by the public, relative to GDP, increased in the United States by twice as much as in Portugal.

The data on the components of the fiscal deficit confirm the impression that the period was not marked by fiscal profligacy. Taxes increased significantly, both on consumption and on labor income, even as they were falling in most of the euro area. Moreover, the decline in interest rates ensured that although the debt was growing, interest payments were roughly constant. The rise in debt was therefore driven by increases in spending, and, as has become the norm in developed countries (Oh and Reis 2012), the bulk of it was in social transfers. It is difficult to see signs of large increases in discretionary spending in the data. Not only did government purchases fall slightly, but so did spending on education, culture, and economic affairs.

More than 100 percent of the increase in total spending comes from a single subcategory of social protection spending: old-age pensions. The last three rows of table 6 show some relevant statistics. Portugal's

Table 6. Public Finances in Portugal and Its Trading Partners, 2000–07

		Change, 2000–07 (percentage points except as noted)		
Indicator	*Portugal, 2007*	*Portugal*	*Euro area*[a]	*Main trading partners*[a]
Government debt as percent of GDP	68.27	17.87	–2.90	–8.70
Taxes as percent of GDP				
Total	32.80	1.70	–0.90	0.56
On consumption	12.60	0.80	–0.40	–0.47
On labor	12.40	0.90	–1.20	–0.46
On capital	7.80	–0.10	0.60	1.44
Government spending as percent of GDP				
Total	44.4	2.8	–0.1	–0.3
Purchases	22.54	–0.53	0.32	0.61
Social protection	15.30	3.30	–0.40	–0.22
Old age	9.30	3.20	n.a.	0.05
Memoranda:				
Percent of the population older than 65	17.25	1.22	1.59	1.12
Pensioners as percent of the labor force	59.00	3.40	n.a.	n.a.
Effective average retirement age	66.32	2.50	n.a.	0.49

Sources: See appendix A.

a. See table 1 for the countries included; n.a. = not available.

population is aging, but not at a faster rate than in other European countries, and the retirement age actually increased during the slump. Thus, the source of this higher spending was not more retirees, but rather more generous pensions.

One can identify two channels through which the system's generosity worked (Organization for Economic Cooperation and Development [OECD] 2009). First, because Portugal has one of the highest rates of old-age poverty in the OECD, it addresses this social concern by having a minimum pension for everyone. The combination of population aging and the slump implied large increases in spending in this antipoverty aspect of the public pension system. Second, the expansions in the generosity of the system occurred in the early 1990s, especially for public servants. It was during 2000–07 that these past promises came due, and spending rose. Notably, in 2000 and 2002, pension reforms that tried to curtail this increase in spending were mostly unsuccessful, and only in 2007 was a more significant reform enacted, which indexed the retirement age to life expectancy and lowered the net replacement rate for the median worker to 73 percent. Thus, the more promising candidate in the fiscal domain to explain the slump is the hike in labor and consumption taxes to fund past promises to pensioners.

I.H. Changes in the Portuguese Labor Market

A familiar mantra about the Portuguese labor market is that it is highly rigid, with strong restrictions on firing and generous unemployment insurance. By the OECD's measures of employment protection, Portugal in 2000 had the second most rigid labor market in a sample of 28 countries. Blanchard and Portugal (2001) estimate low quarterly rates of job creation and destruction in Portugal between 1983 and 1995 and convincingly argue that these were due to high levels of employment protection.

Thus, another hypothesis to explain the slump is that even small adverse shocks may have been compounded through the rigidity of the labor market. However, the labor market in Portugal has changed significantly since 2000. Mariana Pereira (2012) documents the numerous reforms of unemployment insurance since 2000, all of which have made it considerably less generous.

Much the same can be said about restrictions on firing. Labor law reforms have made it easier to sign temporary contracts, which have a fixed term after which the worker can be easily let go at little cost. In 2007 temporary employment was 22 percent of Portuguese employment, against an EU-21 average of 15 percent and an OECD average of 12 percent.[6] Among workers aged 15–24, who entered the labor market recently and so were not covered by outstanding permanent contracts, 52 percent are on temporary contracts, against averages of 43 percent and 26 percent for the EU-21 and the OECD, respectively. Using detailed job flows data, Mário Centeno and Álvaro Novo (2012) estimate that between 2002 and 2006, 85 percent of all Portuguese workers leaving unemployment went into temporary jobs, and that the share of temporary contracts was particularly large in firms expanding employment. The OECD's index of employment protection of temporary workers in 2008 ranks Portugal only 12th out of 40 sampled countries.

6. The EU-21, as defined by the OECD, includes all countries that were EU members before May 2004, plus the four Eastern European member countries of the OECD, namely, Czech Republic, Hungary, Poland, and Slovak Republic.

The gap between worker flows in Portugal and in the United States is also significantly smaller today than in the earlier estimates of Blanchard and Portugal (2001). Centeno, Novo, and Carla Machado (2007) estimate that for 2001–07, the average quarterly rates of job creation and job destruction in Portugal were 5.3 percent and 5.1 percent, respectively; both figures are 1.9 percentage points lower than for the United States during the same period. The annual job turnover rate in Portugal was 25.1 percent, very close to the U.S. level. Alexandre and others (2010) estimate that between 2003 and 2009, the job turnover rate among workers on temporary contracts was 44 percent, compared with 19 percent for permanent contracts.

All combined, the Portuguese labor market since 2000 is best described as a dual market (Centeno and Novo 2012). Most workers still have permanent contracts and are thus 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 relative to the rest of Europe. However, in adjusting to macroeconomic shocks like the 2000–07 slump, the relevant marginal worker, the one who is hired or fired to adjust to changes in demand, is on a temporary contract, which is relatively flexible.

I.I. The Takeaway

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 the real exchange rate. The relative prices of most nontradables sectors rose, yet the expansion in employment and value added was concentrated in wholesale and retail trade and in community and other services, while construction prominently contracted. Worryingly, wholesale and retail trade was also the sector with the second largest relative decline in productivity, and community and other services was the only sector with an increase in estimates of markups. This suggests that an explanation for the Portuguese slump is that the large inflows of capital were misallocated across sectors of the economy, causing the observed fall in the growth of productivity.

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

II. A Model of Misallocation of Foreign Capital Inflows

The theoretical literature on sudden stops (for example, 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 nontradables sector. Gabriel Fagan and Vitor Gaspar (2007) provide one of the first applications of these ideas to the euro area experience. 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, so that net foreign assets fall. The higher consumption of tradables is sustained through imports, whereas nontradables must be produced domestically. This requires a reallocation of inputs into the nontradables sector, and with it an increase in employment in that sector, an increase in real wages, and a real appreciation.

This description fits the Portuguese slump well, with one important exception: there was no boom in consumption or output. Gianluca Benigno and Luca Fornaro (2012) introduce an additional mechanism to explain stagnant output. They assume that technology in the tradables sector improves through learning by doing, so that the reallocation of factors of production away from this sector causes productivity growth to fall. This can account for the fall in measured TFP during the slump. However, productivity in Portugal's nontradables sector also stagnated, whereas Benigno and Fornaro's 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 misallocation of resources across sectors, especially within nontradables. I make simplifying assumptions that shut off the two mechanisms I just described, not because they are not important, but so as to 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 crisis countries in 2000–07.

I present the model in blocks. I start with a model, inspired by Kosuke Aoki, Benigno, and Nobuhiro Kiyotaki (2010), of domestic credit market frictions that lead resources to be misallocated across firms. Next, I present a model of capital inflows from abroad that, interacting with domestic frictions, can lower productivity. Ricardo Caballero and Arvind Krishnamurthy (2001) and Philippe Aghion, Philippe Bacchetta, and Abhijit Banerjee

(2004) are important precursors. Third, I present a simple model of labor supply to make the conventional case that higher taxes will depress economic activity, and a standard model of the allocation of inputs between the tradables and the nontradables sectors.

II.A. Credit Markets and the Misallocation of Capital

For simplicity, I assume that the nontradables sector produces a single good produced by a continuum of entrepreneurs, each with her own production function with productivity drawn from the set $[0, \bar{a}]$. If resources were allocated perfectly, only the entrepreneur with the highest productivity, $\bar{a}$, would be in business. It is a symptom of misallocated resources when some of the nontradable good is produced by any other entrepreneur, leading to average TFP below $\bar{a}$.

In the model such misallocation happens because of imperfect financial markets. Each entrepreneur draws at date t its productivity a_t from the distribution $G(a)$. For simplicity, I assume these draws are i.i.d. and that they are the only source of uncertainty in the economy. An entrepreneur maximizes expected discounted utility,

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

subject to an intertemporal budget constraint,

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

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

Without any further constraints, the most productive entrepreneur would borrow to invest in the optimal amount of capital, while all others would save in the financial markets, providing the funds for this borrowing. The friction that prevents this efficient allocation of resources is a collateral constraint. Each entrepreneur can pledge only an amount θ of her future revenue after paying wages to collateralize her loans:

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

I assume that $\theta < 1$ and that this constraint will bind for the most productive entrepreneur, who is thus unable to raise all the capital needed to supply the efficient amount of the good.

The parameter θ captures limits to credit in the model but can be more broadly interpreted as standing in for a general misallocation of resources across firms, within and across subsectors of the nontradables sector, that prevents the most efficient firms from growing. 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 policymakers or protection from regulators.

Appendix B solves this problem. Because in equilibrium, $r_t \geq r_t^b$, if an entrepreneur is active in production, she will borrow up to the constraint. This allows her to earn a leveraged return, R_t, which rises with the price of the good relative to the labor cost to produce it, p_t^N/w_t, and with the entrepreneur's productivity a_{t-1} relative to the cost of borrowing r_{t-1}^b.

Entrepreneurs sort themselves into two groups, depending on whether their productivity is above or below a threshold a_t^*. Those with low productivity do not produce and instead use their net worth to invest in financial assets, earning r_t. Those with higher productivity produce and borrow to the point where their collateral constraint binds, earning R_t. An economy with an underdeveloped financial market therefore suffers from two inefficiencies in production. On the extensive margin, many inefficient firms are in operation, so $a_t^* < \bar{a}$. 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 misallocation can capture the relevant features of the Portuguese economy highlighted in section I. There are many small firms, most of which are very unproductive. Because the country is still accumulating capital in its convergence process, the 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_t^*. A shock that causes a_t^* to fall lowers measured productivity.

II.B. Capital Inflows and the Expansion of Nontradables

Most Portuguese firms, especially in the nontradables sector, do not have access to international financial markets. Lacking expertise in the local market, foreigners must channel their capital investments through the domestic financial system. In the model, a competitive financial sector receives funds from inactive entrepreneurs and foreigners and channels them to the entrepreneurs that are in business. This sector is the only one that can make loans, because it is the only one that can seize collateral from failing entrepreneurs. One can think of the collateral parameter θ as their technology, so that underdeveloped credit markets are synonymous in the model with an inefficient financial sector.

Financing from abroad comes at an exogenous interest rate, r^f. However, the financial sector can secure funding only by offering as collateral a fraction $\phi \in (0, 1)$ of its loans.[7] The parameter ϕ measures the integration of the country into capital markets. An increase in ϕ comes with an influx of foreign capital into the country.

For banks to make zero profits, the rate of return charged on loans must equal

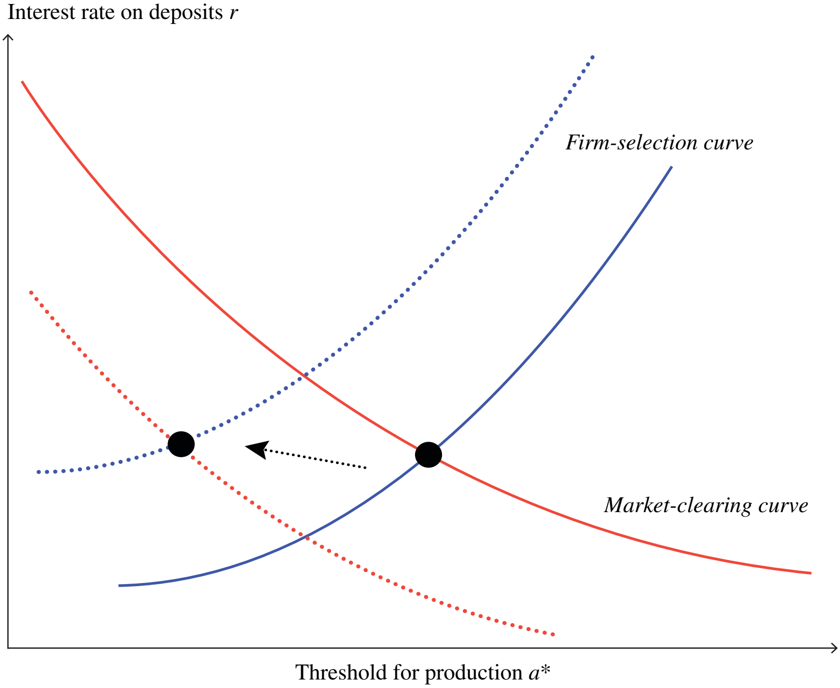
$$\frac{1}{r_t^b} = \frac{\phi}{r^f} + \frac{1-\phi}{r_t}.$$

As long as $\phi < 1$, since $r_t > r_t^f$, one can see that $r_t > r_t^b$ as I assumed earlier. Combining this equation with the threshold for an entrepreneur to be active in production gives a firm-selection curve, depicted in figure 2. If the interest rate paid to inactive entrepreneurs is higher, the interest rate charged on loans must rise with a competitive financial sector. As this lowers the leveraged return that producers can earn, more entrepreneurs choose to stay inactive, leading to an increase in the threshold for production. The firm-selection curve therefore is upward sloping.

In equilibrium, domestic investment in the financial sector must fund a share $1 - \phi$ of the loans. This market-clearing condition gives a downward-sloping relationship between r_t and a_t^*, denoted in figure 2 by the market-clearing line. Intuitively, if fewer entrepreneurs are active and need

7. Because the loans are to the nontradables sector, one could adopt the following technological interpretation of this constraint: banks have access to a technology that allows them to transform nontradable seized collateral into tradable output, the only kind that foreigners are willing to accept, at transformation rate ϕ.

Figure 2. Equilibrium with a Production Threshold for Nontradables Firms



Source: Author's model described in the text.

financing, so that a_t^* is higher, then fewer loans are made, which lowers the demand for deposits and so lowers the interest rate r_t that banks must pay. The intersection of the two schedules gives the unique equilibrium for a_t^* and r_t.

The introduction of the euro removed exchange rate risk for European investors investing in Portugal. Moreover, in its main refinancing operations, the European Central Bank (ECB) started accepting as collateral the 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, making foreigners more willing to supply funds to the Portuguese economy. Therefore, I take the capital inflow shock to correspond to an increase in ϕ.

A higher ϕ shifts both schedules in figure 2 to the left: for a fixed r_t, it lowers r_t^b, increasing the leveraged returns to firms and shifting the firm-selection curve; for a fixed r_t^b, it lowers r_t, so fewer entrepreneurs wish to invest their funds in the financial system, and the market-clearing curve shifts. Unambiguously, a_t^* falls; that is, more entrepreneurs start producing. After 2000, capital from the rest of Europe flowed into Portugal, lowering domestic saving while expanding leverage. Many inefficient firms in the nontradables sector could now obtain financing, so they went into business. Measured TFP fell, and in a simple extension of the model with multiple sectors, it fell the most in those sectors where the expansion was largest, because more unproductive firms entered the market.

Meanwhile, along the intensive margin, the most productive firms do not expand because they are against their collateral constraint, and they may even contract if the price of the nontradable good falls. The euro and the integration of European capital markets did not significantly improve the ability of the domestic financial sector to allocate capital: financial integration did not lead to financial deepening. In terms of the model, ϕ rose but θ did not change. Therefore, the most productive firms were unable to access the newly abundant funds.

II.C. The Tradables Sector and Taxes

The consumption basket in the economy is a Cobb-Douglas aggregator of the nontradable good and a tradable good, with expenditure shares γ and $1 - \gamma$, respectively. The price of the tradable good—the terms of trade—is normalized to 1, and the good is supplied competitively using a Cobb-Douglas technology that is identical to that for nontradables but has a TFP of A. The owner of this technology is a representative household, with preferences

$$\sum_{t=0}^{\infty} \beta^t \ln\left(\hat{C}_t - \frac{L_t^{1+\psi}}{1+\psi}\right).$$

Here the aggregate consumption of the households is $\hat{C}_t$, the households supply all of the labor in the economy L_t, and ψ is the inverse of the Frisch elasticity of labor supply. Labor income is taxed at rate τ, with the proceeds rebated to the household every period. This is the only form of fiscal policy that I consider, since section I concluded that an increase in these taxes was the major change in fiscal policy during the slump.

The budget constraint of the households is similar to that of the entrepreneurs, but they do not need to use the local financial system. Because they produce tradable goods, they can pledge their output to foreigners, and for simplicity I assume they can do so fully. Therefore, all of the production of tradables can be financed using funds from abroad, and the change in financial integration does not affect this sector directly. This is, of course, an extreme assumption, but the important premise for the misallocation hypothesis of the Portuguese slump is only that the nontradables sector is less financially deep than the tradables sector, and so more affected by an influx of new funds from abroad.

Three important results come out of this model of household behavior and production of tradables. First, because there are constant returns to scale in production, the condition of zero profits in the tradables sector requires that the wage rate for the overall economy is pinned down by the foreign real interest rate r^f. This extreme property makes the model quite tractable and is not too dissimilar from the relative stagnation of real compensation discussed in section I. It also implies that changes in the interest rate at which Portugal finances itself abroad have a direct impact on output. This will be important for understanding the crash after 2007.

Second, higher taxes lower after-tax wages and immediately discourage labor supply. Therefore, the increase in taxes in Portugal to finance old-age pension commitments, discussed in section I, will have played a part in lowering output during the slump. The next section asks whether this effect is large.

Third, a condition for the model economy to be credit constrained is that entrepreneurs earn a return above the foreign interest rate; for the economy to be in steady state, this requires that $\beta < 1/r^f$. As a result, the household has no savings and lives hand to mouth, using foreign capital to finance the production of tradables. This is an extreme result, due to the simplicity of the model, but the key fact that is captured is that the tradables sector has better access to external financing. This result implies that when capital flows from abroad, it goes into the nontradables sector. Because that sector competes for labor with the tradables sector, financial integration implies a relative decline in the production of tradables, as well as an increase in the price of nontradables, driving a real appreciation.

III. Further Application of the Model to the Data

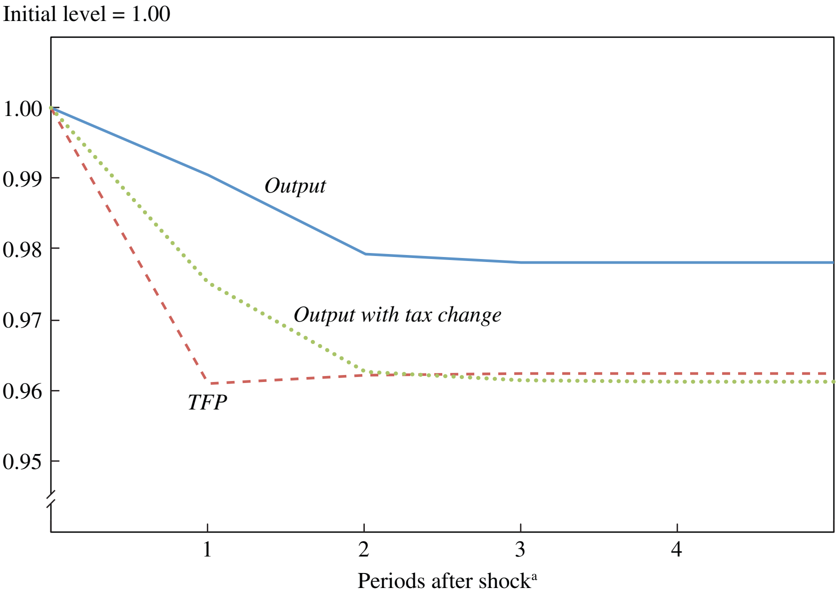
The model's predictions in section II appeared to fit almost all of the facts about the Portuguese economy described in section I. This section explores this match further in three ways. The first is by solving the model and verifying whether the partial-equilibrium intuition in section II survives in general equilibrium. I also ask how far the misallocation hypothesis can explain the slump quantitatively. The second is by asking whether the model can explain why Ireland and Spain boomed during this period, even though they also saw an expansion in nontradables, current account deficits, and a real appreciation. The third is by investigating the role that taxes play in conjunction with the misallocation channel.

Appendix B describes the nonlinear algorithm that solves the model without any approximation. The entire model, from steady state to the responses to shocks, takes a couple of seconds to solve, as long as I assume that the distribution of nontradables productivity $G(a)$ is uniform, which I will.[8] The model is too simple to seriously calibrate to the data, so instead I set parameter values to reasonable values based on the literature. In particular, I take the time period to be 4 years, so that I can abstract from nominal rigidities and make more plausible the assumption that firm-level productivity is i.i.d. I set $r^f = 1.08$, for an annualized real interest rate of 2 percent, which matches the average during this period, and $\beta = 0.84$ for a steady-state return on capital that is twice as large. I set $\alpha = 0.3$, $\gamma = 0.5$, and $\psi = 1$, to match standard business-cycle values for the capital share, the weight of tradables, and the inverse of the Frisch elasticity of labor supply, respectively. The top productivity for nontradables is $\bar{a} = 1$, so that one can interpret $1 - a_t^*$ as the share of projects that are funded, and the parameter A determines only average hours worked. Finally, for the initial value of τ, I use the values in table 6, which imply that the average effective tax on working was 20.8 percent in 2000.

The two most important parameters for the misallocation hypothesis are θ, the degree of financial deepening, and ϕ, the degree of financial integration. Insofar as these proxy for general misallocation, it is hard to pin down their values. An active research literature, surveyed in Diego Restuccia and Richard Rogerson (2013), tries to measure them across countries, but no definite conclusions have been reached. Here I take a very simple back-of-the-envelope approach. Since θ is the share of capital investment by the entrepreneurs that comes from outside sources, I set it equal to the share of bank financing of nonfinancial corporations. That value fluctuated in Portugal from the mid-1990s to 2007 between 0.2 and 0.3, so I set it to 0.25. As for ϕ, recall the basic national income accounting identity that gross saving minus the current account balance must equal gross investment. In the model ϕ measures the share of investment coming from abroad. Because Portugal before the slump had close to balanced external accounts, I set ϕ to zero before the slump.

8. If instead I assume that $a^{1/\alpha}$ is uniform, the model can still be solved with pencil and paper. Outside of these cases, one would have to numerically solve an integral.

Figure 3. Impulse Responses to a Sudden Increase in Financial Integration



Source: Author's calculations using the model described in the text and data sources listed in appendix A.
a. A period is defined to last 4 years.

III.A. The Impact of Financial Integration

From 2000 onward, capital inflows to Portugal were very large. Calculating ϕ as the average of the ratio of the current account deficit to gross investment for the period 2000–07 gives a new value of approximately 0.35. I therefore simulate the model for the case where ϕ unexpectedly increases by 0.35, starting from a steady state. Figure 3 shows the path of output and measured unweighted average TFP in the nontradables sector.

The model is able to generate a sizable slump in economic activity. As capital flows into the nontradables sector, a_t^* falls as more lower-productivity firms are financed, leading to a fall in average productivity. At the same time, labor is drawn away from the tradables sector, lowering its output. Because the relative price of nontradables rises, some of the more efficient nontradables firms can expand, so output may rise or fall. For the baseline parameters, it barely moves initially but then falls significantly.

Table 7 investigates the sensitivity of the change in output to the size of the shock. I vary the increase in ϕ and report the resulting change in output,

Table 7. Impact of Financial Integration on Output under Different Scenarios[a]

	Change in extent of financial integration ϕ				
	0.25	0.30	0.35	0.40	0.45
Output on impact	1.007	0.989	0.990	0.991	0.992
Output in steady state	0.978	0.998	0.978	0.978	0.978
	Level of financial deepening θ				
	0.25	0.30	0.35	0.40	0.45
Output on impact	0.990	1.031	1.003	1.009	1.013
Output in steady state	0.978	1.020	0.988	0.992	1.002

Source: Author's calculations using the model described in the text.
a. Output is set equal to 1.0 in period 0.

both on impact and in the new steady state. If financial integration is even more intense, GDP can fall by as much as 2.2 percent. These are rough estimates, but they suggest that there is potential for the misallocation channel to make financial integration lead to slumps.

III.B. Other Countries

A successful model of the Portuguese slump should also be able to account for what was happening in 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 nontradables, a real appreciation, and a decline in productivity growth. However, unlike Portugal, Ireland and Spain boomed during these years.

One difference relative to Ireland and Spain is that Portugal has a less developed financial system, and judging from the cross-sectional distribution of productivity and management practices across firms, it also likely has more misallocation of capital. In the model this would be captured by a higher θ. Ireland and Spain would then have a higher starting a_t^*, so they would be more productive than the Portuguese economy to start with and have more efficient firms operating at a larger scale.

Table 7 shows the impact of financial integration on output when financial markets are deeper, by increasing θ from the Portuguese value of 0.25. Now, when the capital market integrates with the introduction of the euro and ϕ increases, there is still a fall in TFP in all cases, due to the expansion of the nontradables sector. The model can also still explain the real appreciation, the current account deficits, and most of the other facts shared by Portugal, Ireland, and Spain. However, with deeper financial markets, there is now a larger increase in the capital employed by the more efficient firms, and a smaller rate of entry of unproductive firms. Output in the nontradables sector booms, at the expense of the tradables sector, and the economy booms as well.

The joint lesson from this and the previous section is that if the increase in ϕ is accompanied by an increase in θ, output and welfare will rise. That is, according to the model, a slump is the result of financial integration without financial deepening. If the economy is already more financially developed, or can become so as it opens capital markets to foreign funds, then prosperity will result.

III.C. The Role of Taxes

Section I also showed that taxes rose in Portugal during the period of the slump. Faced with the need to keep up with rapidly rising expenditure on pensions, the government raised the effective tax on working by 1.4 percentage points through increases in consumption and labor taxes. Figure 3 shows the impact of the rise in taxes, modeled as an unexpected permanent change. As one would expect, the slump is now deeper: the model can generate a fall in output of almost 4 percent.

The increase in the average tax rate likely understates the increase in the marginal tax rate. If the marginal rate increased by twice the average rate, the fall in output would be as much as 5.6 percent. At the same time, I assume a value of 1 for the Frisch elasticity of labor supply, which is standard in the macroeconomics literature and consistent with the micro evidence that takes into account the extensive margin, but the findings in the literature are also consistent with an elasticity of 0.5 (Chetty 2012). When the calculations are repeated with this lower elasticity, output in steady state falls less now, by 2.8 percent.

IV. The Boom before the Slump, and the Crash after

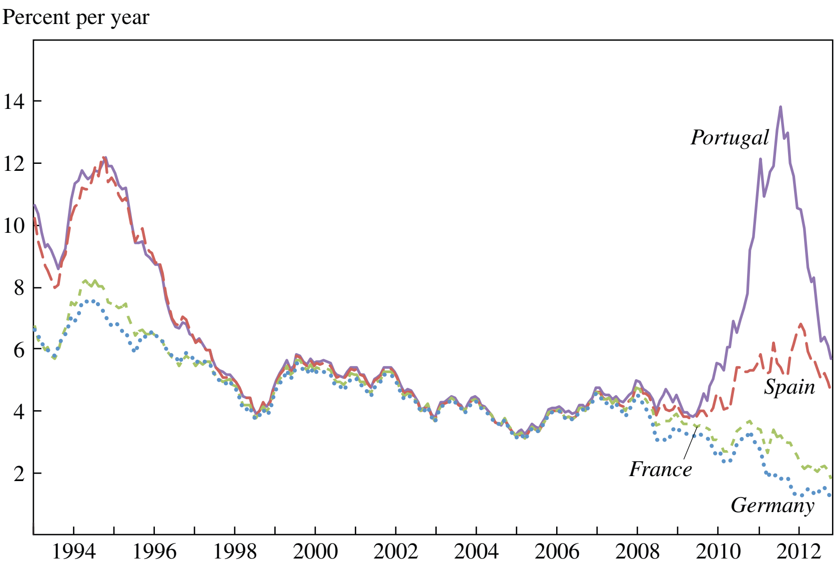
Because the slump between 2000 and 2007 is what makes the Portuguese case distinctive and puzzling, it has been the main focus of this paper so far. The period immediately before the slump, between 1995 and 2000, is also interesting because by then Portugal's adoption of the euro was already very likely, and some of its consequences were already being felt. Section IV.A discusses this period in light of the data and the model. Section IV.B then looks at the period from 2007 until the present, when Portugal was one of several countries in Europe going through a deep crisis. Again I present the main facts and use the model to shed light on them. Other, complementary accounts of the euro crisis have been offered into which Portugal fits naturally, and I discuss these in section IV.C.

IV.A. The Boom of 1995–99

Between 1995 and 2000, Portuguese real GDP per capita grew at an annual rate of 3.8 percent, which was 1.7 percentage points faster than the average in what was to become the euro area. Blanchard and Francesco Giavazzi (2002) note that this rapid growth was likely a result of the launch of European monetary union in 1994. With every passing year it became more likely that Portugal would be an original member of the euro area, and Portuguese long-term interest rates gradually fell, as shown in figure 4. The current account gradually went into deficit, as Portugal could now borrow at more favorable terms than it had in decades.

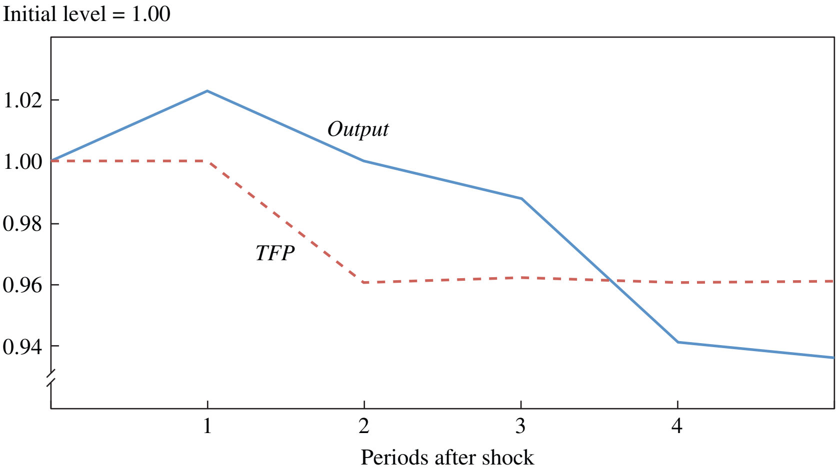
These facts did not seem surprising. Blanchard and Giavazzi (2002) highlight that, in standard open-economy models, a fall in the foreign real interest rate r^f should naturally cause a temporary boom and a current account deficit. However, writing a few years later, Fagan and Gaspar

Figure 4. Ten-Year Interest Rates on Government Bonds in Portugal and Its Main Trading Partners, 1993–2013



Sources: See appendix A.

Figure 5. Boom, Slump, and Crash in the Model after a Series of Financial Shocks[a]



Source: Author's calculations using the model described in the text and data sources listed in appendix A.

a. The impulse is modeled as a 4-percentage-point fall in the foreign real interest rate r^f in period 1, followed in period 2 by financial integration (a rise in ϕ to 0.35) and an increase in taxes by 1.4 percentage points, and finally in period 4 an 8-percentage-point rise in r^f. A period is defined to last 4 years.

(2005) raise the question of why, after the initial boom, Portugal did not experience a gradual growth slowdown and convergence to a new, higher level of income, but instead entered a slump.

The change that this paper has highlighted is that whereas the shock in 1995 was a reduction in the foreign real interest rate, from 2000 onward the gradual integration of European capital markets relaxed foreign borrowing constraints. The ECB allowed banks to pledge a variety of securities, including many nontradable utilities bonds, as collateral against its euro repurchase agreements. Portuguese banks, which until then had funded themselves abroad almost exclusively through the interbank market, were now able to place bonds with foreign investors.

Figure 5 simulates the model after a sequence of unexpected shocks. This is not entirely satisfactory, as many of these changes were at least partly anticipated, but it gives a first pass at understanding the dynamics predicted by the model. In period 1 the foreign real interest rate r^f falls by 4 percentage points, or 1 percentage point per year, as in Blanchard and Giavazzi (2002) and Fagan and Gaspar (2005). Then, in period 2, financial integration occurs, with an increase in ϕ by 0.35 and an increase in taxes by 1.4 percentage points as in the previous section. Approximately

8 years, or two model periods, after the first shock, the foreign real interest rate increases by 2 percentage points per year, to capture the jump in the data in figure 4.

The model captures the boom as well as the slump. It underpredicts the intensity of both of these, but it gets a long way in doing so. The model also predicts a sudden and steep crash in 2008–12. Because the sudden hike in foreign interest rates comes after a period of financial integration, foreign debt is high, and many firms close down once credit becomes more expensive. Therefore, the sudden stop has a larger impact than it would otherwise have had.

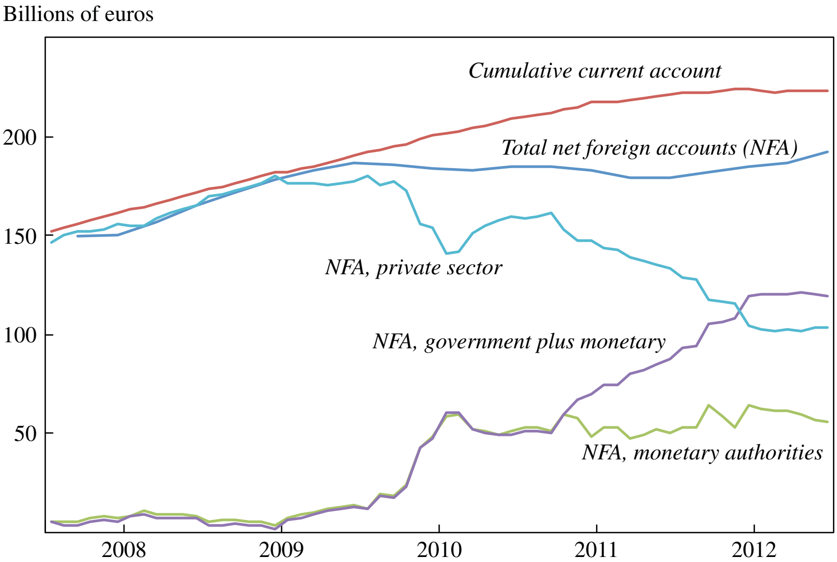
IV.B. The Crash

In 2008 and 2009 most of the developed world was in a recession, making it difficult to separate the global shock from Portugal's crisis. If anything, the Portuguese economy contracted less during those 2 years than the euro area as a whole. In January 2010, however, interest rates on long-term Portuguese government bonds started rising, a few months after the same thing had happened in Greece.

Between 2003 and 2009, interest rates on Portugal's 10-year bonds had hovered between 3.2 and 5.0 percent, but during 2010 they rose from 3.9 percent to 6.5 percent. Public spending also rose markedly, partly because of the automatic stabilizers, and partly because the government, which had won reelection in September 2009, implemented a campaign promise of raising public sector wages after years of zero increases. By the end of March 2011, 10-year interest rates were at 7.8 percent, and banks were reporting 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 2013 did the 10-year interest rate again fall below 7 percent.

In terms of the model, one can think of this shock as an unexpected increase in r^f. Risk premiums rose on most asset classes around the world after the global crisis. This effect was larger in Europe, in part because of the financial instability and political uncertainty over whether and how the sovereign bonds of the periphery countries might default (Lane 2012). As figure 5 showed, the model predicts that such a financial shock will cause a steep drop in output, as capital inflows sharply decline, affecting especially the nontradables sector. All of this occurred in Portugal starting in 2010.

Figure 6. Private Capital Flows in Portugal, 2008–12



Sources: See appendix A.

Figure 6 shows the trajectory of capital flows during this period. The top two lines plot its time series (net foreign assets) and the cumulative current account balance. In 2008 and 2009 the country continued to run large current account deficits and to accumulate a growing foreign debt. Since the start of 2010, however, the foreign debt has been stable. For most of that year, positive valuation effects offset the current account deficit, but by the end of 2012 Portugal had a balanced current account and no capital inflows. That is an extraordinarily sudden stop of capital flowing into the country in the space of 2 years.

The other three lines in the figure break down these capital flows into those flowing through the central bank, those to the government, and those to the private sector. During the slump and into 2008, most capital inflows were private. During 2009, however, private capital inflows stagnated, and all of the new capital came in through the balances in TARGET2, the Eurosystem's interbank payments system. Once the troika rescue was in place, transfers from the monetary authority were replaced by loans to the government. From the middle of 2011 onward, private flows left the country en masse, to an extent comparable to the deepest sudden-stop episodes in Latin America in the last two decades.

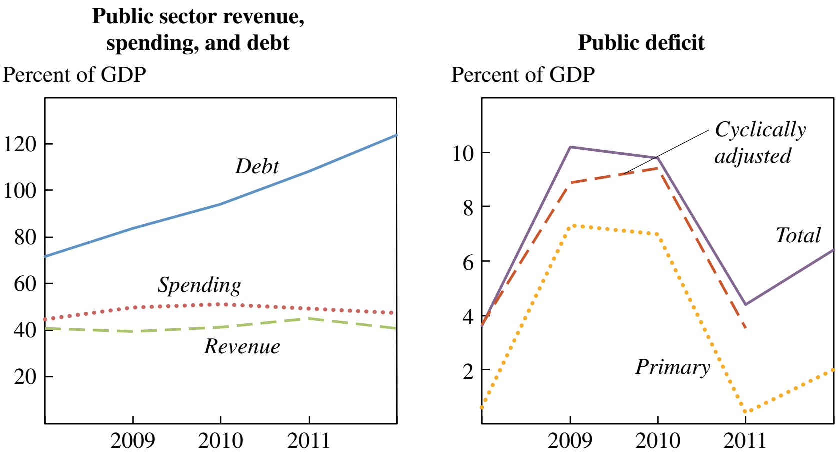
As in the Latin American cases, this sudden stop of capital inflows has resulted in a deep recession in Portugal. From its peak in 2010Q3 to the present, quarterly real GDP has fallen by 10.6 percent, according to the latest available figures (2013Q1), and the unemployment rate is at 17.7 percent. However, whereas the collapse in the Latin American countries was often followed by a quick recovery (Calvo and others 2006), the Portuguese economy shows no signs of resuming growth. The policies usually associated with these "phoenix miracles" have not been present in Portugal: there have been no significant writedowns on the external debt, and monetary policy has been tight, with no nominal depreciation of the euro or significant inflation.

IV.C. Further Ingredients of the Crash: Banks, Austerity, and Wages

Because Portugal's banks were at the center of the capital flows—and in 2010 accounted for approximately half of the net foreign debt—they were the most affected by the capital reversal. As part of the troika package, three of the four largest banks have been recapitalized with public funds. Two characteristics of Portuguese banks are shared with other European banks, but not with their American counterparts. First, the principal Portuguese banks are very large relative to the size of the economy. In 2008 the largest Portuguese bank, Banco Comercial Português, had liabilities equal to 54 percent of GDP (Demirgüç-Kunt and Huizinga 2013), and its share price has fallen from above 70 cents at the start of 2008 to less than 10 cents since 2012. As a result, when a severe banking crisis occurs, the ability of the already revenue-strapped government to rescue the banks comes seriously into question. Second, Portuguese banks hold large amounts of Portuguese government securities. In the December 2010 European Banking Authority stress tests, the exposure of Portuguese banks to Portuguese government debt was estimated at 23 percent of their assets. As a result of these features, sovereigns and banks in Europe are joined at the hip: the correlation between credit default swap spreads for sovereigns and banks is close to 1 (Mody and Sandri 2012).

As Maurice Obstfeld (2013) emphasizes, the euro crisis is at its heart a financial crisis. Markus Brunnermeier and coauthors (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 solvency of banks in that country at risk, since banks typically hold so much of their assets in the sovereign debt of their country. But should the banks fail, the government's net spending will increase, either directly because of the

Figure 7. Public Finances in Portugal, 2008–12



Sources: See appendix A.

need for a bailout, or indirectly because of the recessionary impact of the banking crisis. Either way the initial fears are confirmed, and the economy may easily fall to a lower equilibrium. Reis (2013) puts forward a simple model of this mechanism.

The left-hand panel of figure 7 plots Portuguese public sector revenue and spending and the stock of public debt from 2008 through 2012; the right-hand panel does the same for the public deficit. In 2011 there was a serious consolidation of public finances, with the first reduction in the ratio of spending to GDP in more than 20 years and a primary deficit close to zero. Yet as GDP fell in 2012, the consequent fall in revenue drove an increase in the deficit, and the debt at the end of 2012 was 123.6 percent of GDP, well above the objective of 111.8 percent set out in the first review of the memorandum of understanding with the troika. Much ink has been spilled over the dilemma faced by a country in this situation: on the one hand, a country suffering a run on its debt must have a credible plan to lower its public deficit, while on the other hand implementing fiscal austerity prolongs the recession.

Structural reform was also part of the agenda. The memorandum of understanding with the troika listed 223 separate reforms for Portugal to undertake, covering most areas of government intervention. The six reviews of the program so far have agreed that most have been implemented on schedule. To take one striking example, Portugal had the 2nd-highest OECD employment protection index in 2000, the 7th highest by 2009, and with all the implemented reforms, it is forecasted to be in the 13th spot in 2012 (IMF 2013). The crisis has forced reforms that had been necessary but politically infeasible before (Fernandez-Villaverde, Garicano, and Santos 2013).

Given the large increase in unemployment, one 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 percent, and unit labor costs by 4 to 6 percent. An example of these nominal wage rigidities is illustrative: on net, one-third of the jobs in the construction sector were destroyed between 2006 and 2012. Yet although approximately 170,000 workers are now without a job, nominal wages in the sector are fixed by collective bargaining and have not fallen a single cent. Schmitt-Grohé and Uribe (2011) show that these rigidities deepen the recession following a sudden stop.

V. Conclusion and Policy Options

The events in the Portuguese economy since 2000 have been troubling. Like many countries before it, Portugal went through a gradual increase in capital inflows, starting in 1995 and intensifying after 2000. Although initially these capital flows led to a boom, as they had in other countries before, they triggered a slump from 2000 onward. I have suggested that this happened because most of the capital inflows funded unproductive firms in the nontradables sector, causing economy-wide productivity to fall and the real exchange rate to rise, and taking resources away from the tradables sector. Meanwhile, generous past promises on old-age pensions led to continuous increases in taxes, which discouraged work and aggravated the slump. As the country quickly became financially integrated with the rest of the euro area, net foreign borrowing rose, leaving it particularly exposed to the financial crisis that came at the end of the decade. After 2010, a sudden stop in capital flows plunged the country into a crash.

What could policy have done about this? Taking as given that Portugal wanted to join the euro and achieve monetary and financial union with the rest of Europe, the account in this paper still suggests a few policy options. First, according to the model, actively fighting the creation of rents in the nontradables sector, as suggested by Bento (2010a), would have improved capital allocation. Enforcing greater competition would have been one way to do so, and a more direct approach might have been to slow down public investment in those sectors.

Second, more prudential financial regulation could have curtailed the sudden increase in foreign borrowing. One possibility would have been to impose and enforce limits on leverage in the financial sector. More generally, the model suggests that if policymakers foresee a period of rapid financial integration, they should focus their energy on promoting financial deepening in their country.

Third, the absence of fiscal profligacy should not serve to excuse Portugal's management of its public finances. An earlier reform of old-age pensions, other cuts in spending programs, and less distortionary tax increases would have been potentially more effective ways to deal with the pensions problem.

I have emphasized throughout the paper the similarities between the events in Portugal and those occurring contemporaneously in Greece, Ireland, and Spain as well as the similarities with the sudden stops that many other countries have suffered through in the last three decades. The singularity of the Portuguese slump provides some new data that future research might use to improve our understanding of these pervasive phenomena, leading to better policy responses in the future.

APPENDIX A

Data Sources

The data for the calculations in this paper come mostly from three sources: the *OECD Economic Outlook,* the AMECO database of the European Commission (and sometimes Eurostat directly), and the KLEMS project (www.euklems.net) by O'Mahony and Timmer (2009). More recent data not in those databases come directly from the Banco de Portugal and the Instituto Nacional de Estatística.

Figure 1: The Portuguese series is real GDP per capita from AMECO, the U.S. series is series GDPA in the FRED database (Federal Reserve Economic Data, from the Federal Reserve Bank of St. Louis) divided by population from the Census Bureau, and the Japanese series is from the World Bank's World Development Indicators.

Table 1: The data on interest rates are series IRL with interest on government bonds, from the OECD; all other series are from AMECO.

Table 2: The value for net foreign assets comes from the updated and extended version of the data set constructed by Lane and Milesi-Ferretti

(2007) on the wealth of nations (www.philiplane.org/EWN.html), the current account and trade account balances are from the OECD, and the number for trade outside the European Union is from AMECO.

Table 3: The real and nominal exchange rates are calculated by the OECD. The terms of trade with respect to all trading partners are measured by Eurostat in AMECO; for the terms of trade of the euro area and the main trading partners, I use the relative price deflators of the manufacturing sector to proxy for tradables. The value added measure for all industries and all trading partners is from Robert Johnson (sites.google.com/site/robjohnson41/research); for the euro area and the main trading partners, I use the price deflators in KLEMS for Portugal, the euro area, and Spain, Germany, and France.

Table 4: The source is KLEMS. The five main-industry codes are manufacturing (D), construction (F), real estate, renting, and business activities (K), community, social, and personal services ("community and other services" in the text, LtQ), and wholesale and retail trade (G).

Table 5: Total factor productivity corresponds to the TFP measures in KLEMS. For markups I again use KLEMS to calculate the log of the ratio between VA (value added) and LAB (labor compensation).

Table 6: The debt figures come from the OECD. The numbers for taxes come from the annex to the European Commission report on taxation trends in the European Union (ec.europa.eu/taxation_customs/taxation/gen_info/economic_analysis/tax_structures/index_en.htm). The numbers for the categories of spending come from Eurostat via Oh and Reis (2012). The old-age pension statistics come from the OECD and Eurostat.

Figure 4: All data are from the irs.m series of the European Central Bank statistical warehouse on long-term interest rates for convergence purposes.

Figure 6: All series come from the Banco de Portugal website. I start from the net international investment position reported for December 2007. The series for net foreign assets is this quarterly series over time; the cumulative current account starts from that value and accumulates the balance in the current account. The breakdown into the three sectors is from the financial account.

Figure 7: All series are from AMECO and Eurostat, in its statistics for government finances.

Finally, the more recent numbers for the Portuguese economy reported in section IV all come from the website of the Instituto Nacional de Estatística.

APPENDIX B

More Details on the Model

There are three types of agents: entrepreneurs, banks, and households. I discuss each in turn, using lowercase letters to denote individual choices by entrepreneurs, capital letters to denote their aggregate, and capital letters with a caret (such as $\hat{C}$) to denote the choices of the representative household.

B.1. The Entrepreneurs' Problem

A continuum of entrepreneurs, with density $G(a)$, at date t, choose $\{c_t, n_t, k_t, d_{t+1}, b_{t+1}\}$ in order to solve the following problem (see section II.A for variable definitions):

$$\text{(B.1)} \qquad \max \mathrm{E}\left[\sum_{t=0}^{\infty} \beta^t \ln(c_t)\right] \quad \text{subject to:}$$

$$\text{(B.2)} \qquad p_t c_t + k_t + \frac{d_{t+1}}{r_t} - \frac{b_{t+1}}{r_t^b} = p_t^N a_{t-1} k_{t-1}^{\alpha} n_t^{1-\alpha} - w_t n_t + d_t - b_t$$

$$\text{(B.3)} \qquad b_t \leq \theta[p_t^N a_{t-1} k_{t-1}^{\alpha} n_t^{1-\alpha} - w_t n_t]$$

$$\text{(B.4)} \qquad d_{t+1} \geq 0, \quad b_{t+1} \geq 0, \quad k_t \geq 0.$$

The choice of n_t has no intertemporal dimension, so we can find the optimum directly by maximizing revenue net of labor costs. This gives

$$\text{(B.5)} \qquad p_t^N a_{t-1} k_{t-1}^{\alpha} n_t^{1-\alpha} - w_t n_t = x_{t-1} k_{t-1}$$

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

while the demand for labor is

$$\text{(B.7)} \qquad n_t = \left[\frac{(1-\alpha)\, p_t^N a_{t-1}}{w_t}\right]^{1/\alpha} k_{t-1}.$$

The entrepreneur then has three investment options available at date t: capital with return x_t, lending with return r_t, and borrowing with return r_t^b. I will later verify that $r_t \geq r_t^b$ in equilibrium. Moreover, if x_t is higher than r_t^b, clearly the collateral constraint will bind, so that investing in the firm gives a leveraged return. Therefore, the choice is whether to save in the bank, earning return r_t, or use the production technology, earning a leveraged multiple of the marginal product x_t. The return therefore is

$$(\text{B.8}) \qquad R_{t,t+1}(a_t) = \max\left\{ r_t, \frac{(1-\theta)x_t}{1-\frac{\theta x_t}{r_t^b}} \right\},$$

which is larger than x_t as long as $\theta > 0$ and $r_t^b > 0$, that is, as long as the entrepreneur can profitably leverage her investment. This return on investing in capital at t for producing at $t+1$ is a function of the individual a_t and the aggregate p_{t+1}^N and w_{t+1}, all via the definition of x_t in equation B.6. I use the notation $R_{t,t+1}(a_t)$ to capture this dependence.

The net worth of the entrepreneur is the right-hand side of the budget constraint in equation 2: $z_t = x_{t-1}k_{t-1} + d_t - b_t$. If $R_{t,t+1}(a_t) = r_t$, then $k_t = b_{t-1} = 0$, and $z_t = d_t$, so the entrepreneur invests all his funds in the financial market. Otherwise, if $R_{t,t+1}(a_t) > r_t$, then $d_t = 0$, and the collateral constraint binds, so $b_{t+1} = \theta x_t k_t > 0$, and investment is constrained by net worth: $x_t k_t = z_{t+1}/(1-\theta)$. The threshold a_t^*, such that entrepreneurs with productivity higher than a_t^* produce, while those below a_t^* are inactive and save in the bank, is then the solution to the following equation:

$$(\text{B.9}) \qquad R_{t,t+1}(a_t^*) = r_t.$$

Combining these results, the consumption problem of the entrepreneur then becomes

$$(\text{B.10}) \qquad \max \mathrm{E}\left[\sum_{t=0}^{\infty} \beta^t \ln(c_t)\right] \quad \text{subject to:}$$

$$(\text{B.11}) \qquad z_{t+1} = R_{t,t+1}(a_t)(z_t - p_t c_t) \text{ and } z_t \geq 0.$$

This is a standard problem with solution

$$(\text{B.12}) \qquad p_t c_t = (1-\beta) z_t$$

$$(\text{B.13}) \qquad z_{t+1} = R_{t,t+1}(a_t)\beta z_t.$$

B.2. The Banks' Problem

A representative bank at date t chooses B_{t+1}, F_{t+1}, D_{t+1} to solve the problem

$$\max B_{t+1} - F_{t+1} - D_{t+1} \text{ subject to:} \tag{B.14}$$

$$\frac{D_{t+1}}{r_t} + \frac{F_{t+1}}{r^f} = \frac{B_{t+1}}{r_t^b}, \tag{B.15}$$

$$F_{t+1} \leq \phi B_{t+1}, \tag{B.16}$$

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

I will throughout consider equilibria where $r^f < r_t$ if $\phi > 0$, in which case the foreign financing constraint holds with equality: $F_{t+1} = \phi B_{t+1}$. Moreover, in equilibrium banks earn zero profits, so $B_{t+1} = F_{t+1} + D_{t+1}$.

The remaining optimality condition for the entrepreneurs implies that

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

It then follows that $r_t \geq r_t^b$, as I imposed on the entrepreneurs' problem.

I can then revise the expression for the effective return on entrepreneurs by substituting out r_t^b:

$$R_{t,t+1}(a_t) = \max\left\{ r_t, \frac{(1-\theta)x_t}{1 - \frac{\theta\phi x_t}{r^f} - \frac{\theta(1-\phi)x_t}{r_t}} \right\}. \tag{B.19}$$

Using this definition and the equilibrium equation (equation 9) gives the firm-selection curve discussed in the text.

B.3. Market Clearing for Loans

The other optimality condition for banks implies that

$$(1-\phi)B_{t+1} = D_{t+1}. \tag{B.20}$$

This is a market-clearing condition, requiring that the domestically financed loans made to active entrepreneurs equal the deposits collected from inactive entrepreneurs. Returning to the behavior of active entrepreneurs,

$$\text{(B.21)} \qquad B_{t+1} = \int_{a_t^*}^{\bar{a}} b_{t+1}\, \mathrm{d}G(a_t) = \int_{a_t^*}^{\bar{a}} \frac{\theta z_{t+1}}{1-\theta}\, \mathrm{d}G(a_t)$$

$$= \int_{a_t^*}^{\bar{a}} \frac{\theta\beta R_{t,t+1}(a_t) z_t}{1-\theta}\, \mathrm{d}G(a_t) = \frac{\theta\beta Z_t}{1-\theta} \int_{a_t^*}^{\bar{a}} R_{t,t+1}(a_t)\, \mathrm{d}G(a_t).$$

Here the first equality is the definition of aggregate loans, the second uses the binding collateral constraint and the definition of net worth, the third is the law of motion for net worth, and the fourth uses the fact that with i.i.d. productivity returns, the entrepreneur's past net worth z_t and his new return $R_{t,t+1}(a_t)$ are orthogonal. Z_t is aggregate net worth across all entrepreneurs.

As for inactive entrepreneurs, by similar steps,

$$\text{(B.22)} \qquad D_{t+1} = \int_0^{\bar{a}} d_{t+1}\, \mathrm{d}G(a_t) = \int_0^{\bar{a}} z_{t+1}\, \mathrm{d}G(a_t) = \int_0^{\bar{a}} \beta r_t z_t\, \mathrm{d}G(a_t)$$

$$= \beta r_t Z_t G(a_t^*).$$

The market-clearing condition then becomes

$$\text{(B.23)} \qquad \frac{(1-\theta) r_t}{\theta(1-\phi)} = \frac{\int_{a_t^*}^{\bar{a}} R_{t,t+1}(a_t)\, \mathrm{d}G(a_t)}{G(a_t^*)}.$$

Finally, the law of motion for the aggregate net worth of entrepreneurs is

$$\text{(B.24)} \qquad Z_{t+1} = \int_0^{\bar{a}} z_{t+1}\, \mathrm{d}G(a_t) = \beta \int_0^{\bar{a}} R_{t,t+1}(a_t) z_t\, \mathrm{d}G(a_t)$$

$$= \beta Z_t \left[r_t G(a_t^*) + \int_{a_t^*}^{\bar{a}} R_{t,t+1}(a_t)\, \mathrm{d}G(a_t) \right]$$

$$= \left[\frac{\beta(1-\theta\phi)}{\theta(1-\phi)} \right] G(a_t^*) r_t Z_t.$$

The first equality comes from the definition of aggregates, the second from the evolution of individual net worth in equation B.13, the third uses the independence of z_t and $R_{t,t+1}(a_t)$ as well as the definition in equation B.19, and the fourth uses the market-clearing relationship in equation B.23.

B.4. Households

A representative household solves

$$\max \sum_{t=0}^{\infty} \beta^t \ln\left(\hat{C}_t - \frac{\hat{L}_t^{1+\psi}}{1+\psi}\right) \text{ subject to:} \tag{B.25}$$

$$p_t\hat{C}_t + \hat{K}_t - \frac{\hat{F}_{t+1}}{r^f} = A\hat{K}_{t-1}^{\alpha}\hat{N}_t^{1-\alpha} - w_t\hat{N}_t - \hat{F}_t + (1-\tau)w_t\hat{L}_t + T_t, \tag{B.26}$$

$$\hat{F}_t \leq A\hat{K}_{t-1}^{\alpha}\hat{N}_t^{1-\alpha} - w_t\hat{N}_t. \tag{B.27}$$

The solution is standard. Starting with the production problem, labor demand is

$$\hat{N}_t = \left[\frac{(1-\alpha)A}{w_t}\right]^{1/\alpha}\hat{K}_{t-1}. \tag{B.28}$$

The collateral constraint does not distort production decisions, so the agent must earn zero profits in production; otherwise she would expand or shrink production without bounds.

The zero-profit condition is

$$r^f = \alpha(1-\alpha)^{\frac{1-\alpha}{\alpha}}\left(\frac{A}{w_{t+1}^{1-\alpha}}\right)^{\frac{1}{\alpha}}. \tag{B.29}$$

Note that this equation pins down the pre-tax wage as a function solely of the foreign interest rate.

Turning to the labor supply problem, the optimality condition is

$$\hat{L}_t = \left[\frac{w_t(1-\tau)}{p_t}\right]^{\frac{1}{\psi}}. \tag{B.30}$$

Finally, for the optimal choice of consumption, because I assume that $\beta < 1/r^f$, I know that eventually the borrowing constraint will hold. Since I start from a steady state, this is true then and after, so that foreign borrowing sustains all of the capital in the tradables sector, and consumption is equal to labor and transfer income:

$$\hat{C}_t = \frac{(1-\tau)w_t\hat{L}_t + T_t}{p_t} = \frac{w_t\hat{L}_t}{p_t}. \tag{B.31}$$

Here the second equality uses the government budget constraint, $\tau w_t\hat{L}_t = T_t$.

B.5. Consumption of Nontradables

Both households and entrepreneurs share the same Cobb-Douglas aggregator over the two goods with weight γ on the nontradable good. Optimal allocation of their budget comes with the following two conditions:

$$p_t^N\bar{C}_t^N = \gamma p_t\bar{C}_t \tag{B.32}$$

$$p_t = \gamma^{-\gamma}(1-\gamma)^{-(1-\gamma)}p_t^{N\gamma}, \tag{B.33}$$

where I introduce new notation for aggregate consumption, $\bar{C}_t = \hat{C}_t + \int c_t \mathrm{d}G(a_t)$, and likewise for $\bar{C}_t^N$.

Focusing on the first of these equations, first note that for the market to clear, the amount consumed of nontradables must equal the amount produced by the entrepreneurs: $\bar{C}_t^N = Y_t^N$. In turn, because the production function is Cobb-Douglas, we know that for every active entrepreneur, $w_t n_t = (1-\alpha)p_t^N y_t^n$. Aggregating this across all entrepreneurs, we get that

$$p_t^N\bar{C}_t^N = \frac{w_t N_t}{1-\alpha} = \gamma p_t\bar{C}_t = \gamma\left(w_t L_t + (1-\beta)Z_t\right). \tag{B.34}$$

Here the last equality uses the optimal consumption choices by entrepreneurs in equation B.12 and likewise for households in equation B.31.

Next I focus on the amount of labor used by entrepreneurs,

$$\begin{aligned} N_t &= \int_{a_t^*}^{\bar{a}} n_t \mathrm{d}G(a_{t-1}) = \left[\frac{(1-\alpha)p_t^N}{w_t}\right]^{1/\alpha} \int_{a_{t-1}^*}^{\bar{a}} a_{t-1}^{1/\alpha}k_{t-1}\,\mathrm{d}G(a_{t-1}) \\ &= \left[\frac{(1-\alpha)p_t^N}{w_t}\right]^{1/\alpha}\left(\frac{\beta Z_{t-1}}{1-\theta}\right)\int_{a_{t-1}^*}^{\bar{a}} \frac{a_{t-1}^{1/\alpha}R_{t-1,t}(a_{t-1})}{x_{t-1}}\,\mathrm{d}G(a_{t-1}) \\ &= \left[\frac{\beta(1-\alpha)}{\alpha(1-\theta)}\right]\left(\frac{Z_{t-1}}{w_t}\right)\int_{a_{t-1}^*}^{\bar{a}} R_{t-1,t}(a_{t-1})\,\mathrm{d}G(a_{t-1}) \\ &= \left[\frac{1-\alpha}{\alpha(1-\theta\phi)}\right]\left(\frac{Z_t}{w_t}\right). \end{aligned} \tag{B.35}$$

The first equality uses the definition of the aggregate, the second uses the labor demand in equation B.7, the third uses the binding collateral constraint for capital, the fourth uses the definition of x_t in equation B.6, and the last equation uses the equilibrium conditions in equations B.23 and B.24.

Using this expression to replace for N_t, I then obtain the final condition:

$$\text{(B.36)} \qquad \left[\frac{1}{\gamma\alpha(1-\theta\phi)} + \beta - 1\right] Z_t = w_t L_t.$$

B.6. A Reduced-Form Equilibrium

Recall that from equation B.29, the equilibrium wage w_{t+1} is entirely pinned down by the exogenous foreign interest rate r^f. Starting with a given net worth of the entrepreneurs Z_t and an exogenous wage w_{t+1}, a reduced-form equilibrium is a collection of $\{L_{t+1}, a_t^*, r_t, p_{t+1}^N, Z_{t+1}\}$ that solves the following equations:

$$\text{(B.37)} \qquad L_{t+1} = \left(\frac{w_{t+1}(1-\tau)}{\gamma^{-\gamma}(1-\gamma)^{-(1-\gamma)} p_{t+1}^{N\gamma}}\right)^{\frac{1}{\psi}}$$

$$\text{(B.38)} \qquad \left[\frac{1}{\gamma\alpha(1-\theta\phi)} + \beta - 1\right] Z_{t+1} = w_{t+1} L_{t+1}$$

$$\text{(B.39)} \qquad Z_{t+1} = \left[\frac{\beta(1-\theta\phi)}{\theta(1-\phi)}\right] G(a_t^*) r_t Z_t$$

$$\text{(B.40)} \qquad R_{t,t+1}(a_t^*) = r_t$$

$$\text{(B.41)} \qquad \frac{(1-\theta)r_t}{\theta(1-\phi)} = \frac{\int_{a_t^*}^{\bar{a}} R_{t,t+1}(a_t)\, \mathrm{d}G(a_t)}{G(a_t^*)},$$

where R is defined as in equations B.19 and B.6.

Solving this system is relatively easy because of its particular structure. Start with finding a steady state. For a guess at the value of a^*, equation B.39 gives r, equation B.40 (with equations B.6 and B.19) gives p^N, and equation B.41 verifies the guess. Equations B.37 and B.38 then give L and Z, respectively. The only difficulty is in solving the integral. But because this is an integral of the form $\int a^{1/\alpha}/(1-\xi a^{1/\alpha})\mathrm{d}G(a)$, then for a uniform distribution for a, its solution is known and equal to a hypergeometric function. If instead $a^{1/\alpha}$ is uniform, then the integral is equal to a log function.

To instead find a dynamic perfect-foresight path, note that the first three equations can be used to eliminate Z_{t+1} and L_{t+1}, leaving three equations in three variables $\{a_t^*, r_t, p_t^N\}$. Equation B.40 can be further used to eliminate r_t from the system, leaving two messy equations in $\{a_t^*, p_t^N\}$. Guessing a value for a_t^*, backing out the implied p_t^N, and then checking equation B.41 gives a quick algorithm. It takes a few seconds to solve.

B.7. Other Variables of Interest

Once the reduced-form equilibrium has been derived, one can obtain other variables of interest. I list here only the main ones, all using results from earlier in the paper:

$$N_t = \left[\frac{1-\alpha}{\alpha(1-\theta\phi)}\right]\left(\frac{Z_t}{w_t}\right) \tag{B.42}$$

$$Y_t^N = (1-\alpha)w_t N_t / p_t^N \tag{B.43}$$

$$K_t = \left(\frac{\beta Z_t}{1-\theta}\right)\int_{a_t^*}^{\bar{a}} \frac{R_{t,t+1}(a_t)}{x_t} \mathrm{d}G(a_t) \tag{B.44}$$

$$F_t = \left(\frac{\theta\phi}{1-\theta\phi}\right)Z_t \tag{B.45}$$

$$\hat{N}_t = L_t - N_t \tag{B.46}$$

$$\hat{Y}_t = (1-\alpha)w_t\hat{N}_t \tag{B.47}$$

$$\hat{F}_t = \alpha\hat{Y}_t \tag{B.48}$$

$$\hat{K}_{t-1} = \hat{F}_t / r^* \tag{B.49}$$

$$C_t = \frac{w_t\hat{L}_t + (1-\beta)Z_t}{p_t}. \tag{B.50}$$

In the figures I plot aggregate output and TFP, defined, respectively, as

$$Y_t = \hat{Y}_t + p_t^N Y_t^N \tag{B.51}$$

$$\mathrm{TFP}_t = (a_t^* + \bar{a})/2. \tag{B.52}$$

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Comments and Discussion

COMMENT BY

OLIVIER BLANCHARD This paper by Ricardo Reis makes two contributions. The first is to provide a formalization of an important theme, namely, that financial opening without financial deepening can be counterproductive. This theme has been around for a while and has led in particular to a rethinking of the role of capital controls, but I have not seen it formalized before. The simple analytical structure offered by Reis is elegant and user friendly. This is the part of the paper I like most.

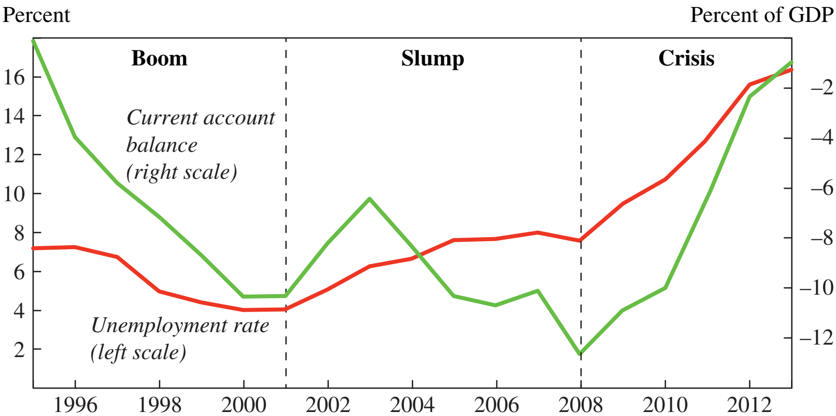
The paper's second contribution is an interpretation of the Portuguese slump through the filter of this model. Here I am less convinced. I am willing to believe that higher capital flows indeed led to some mishandling and some misallocation of resources. But I am skeptical that this is one of the major factors in the Portuguese tragedy.

Reis focuses on the period 2000–07. As he emphasizes, taken on their own, the facts of that period in Portugal are indeed puzzling: large capital flows, low interest rates, but little or no growth. Ricardo offers a tentative resolution to the puzzle: misallocated capital flows led to decreasing productivity, in particular in the nontradables sector.

I believe, however, that there is no puzzle. By choosing 2000 as the starting date, Ricardo starts the story in the middle. The full story, which starts circa 1995, is in fact quite straightforward. Its main elements are summarized in my figure 1, which plots Portugal's unemployment rate and the ratio of its current account balance to GDP. The story has three chapters.

The first chapter, which starts in 1995 and ends in 2000, is the story of the boom. It is shown in the first panel of figure 1's triptych. The proximate causes of the boom are clear: a sharp decrease in the interest rate (as shown in Reis's figure 4), reflecting the steady decrease in perceived country risk

Figure 1. Current Account Balance and Unemployment Rate in Portugal, 1995–2013



Source: International Monetary Fund, World Economic Outlook database.

in anticipation of Portugal's entry into the euro area, and expectations of sustained growth, again from adoption of the euro. The implications are equally straightforward: strong demand and sustained growth, the latter running at an average of 4 percent per year, leading to a decrease in the unemployment rate from 7.5 percent to 4 percent, together with an increase in the price of nontradables, increased demand for tradables, and a large increase in the current account deficit, from rough balance in 1995 to 10 percent of GDP by 2000.

The second chapter—the focus of most of the paper—which starts in 2001 and ends in 2007, is the story of the slump. It is shown in the middle panel of figure 1. As the start of the euro does not lead to the hoped-for growth miracle, Portuguese households and firms revise their expectations, and private demand slows down. The textbook adjustment process suggests that this should lead to a decrease in the price of nontradables, a shift in consumption toward nontradables, a shift in production toward tradables, and a decrease in the current account deficit. This does not take place, however, partly because countercyclical fiscal policy props up demand and output—the budget deficit remains high, at around 5 percent of GDP—and partly because of nominal wage and price rigidities. Indeed, nominal wage growth continues, in excess of productivity growth (which is low), leading to a further real appreciation and a current account deficit that remains around 10 percent of GDP.

Under this interpretation, large capital inflows and slow growth are not surprising. Growth is slow because of the slump, but the current account deficit remains large, implying, as a matter of identities, large capital inflows to finance it. One obvious question is why foreign investors continue to be willing to lend at such low rates, despite the mounting risks. As we know, the question is relevant not only for Portugal, but also for many of the other countries in the euro area's periphery. And the answer, unsatisfactory as it is, is that investors often ignore or understate risks until they suddenly wake up and demand larger spreads.

This takes us to the third chapter, which started in 2008 and is still unfinished. It is shown in the third panel of the triptych. With the global crisis, exports decrease, leading to a decrease in output and an increase in unemployment. Low output leads in turn to an increase in nonperforming loans, weakening the banks. It also leads to low tax revenue, weakening the fiscal position. The "diabolical loop" then comes into play: given that banks have sovereign bonds on their books, the fiscal weakness of the sovereign weakens the banks, and the need to recapitalize the weak banks further weakens the state. The sudden stop eventually comes, partially offset by liquidity provision from the European Central Bank to the banks, but still associated with limited access to financial markets for the state, and with high rates of interest for private borrowers. As of early 2013, the unemployment rate had increased to 17 percent. Largely because of low output and thus low imports, the current account deficit has been dramatically reduced and is now close to zero.

Looking forward, the adjustment that should have taken place much earlier now has to take place under much tougher conditions, namely, high interest rates and substantial fiscal consolidation. Since their peak in the first quarter of 2009, unit labor costs in tradables (proxied as industry excluding construction) have come down by about 20 percent, nearly all of that due to higher productivity rather than lower wages. This is mixed news, however. Higher productivity has come from labor shedding, with employment decreasing more than output, and thus it remains to be seen how many of these gains are permanent. And although exports are doing better, internal demand is weak, and output continues to decrease. Thus, the adjustment is far from over.

In short, I have argued that Portugal has gone through a rather standard boom-bust cycle, triggered in part by low interest rates, and with the adjustment made more difficult by the fixed nominal exchange rate. What about the importance of the capital misallocation mechanism that Reis emphasizes? Again, if one looks at the period starting in 1995 rather than 2000, as he does, Portugal's productivity has been about the same as the EU average: with both normalized to 100 in 1995, labor productivity in Portugal stood at 109 in 2007 versus 112 for the EU-17. The difference is probably within the range of measurement error, and the numbers are more a reflection on the dismal productivity growth in the European Union since the mid-1990s than a reflection on Portugal. This being said, the mechanism emphasized by Reis may have played a role, and in general, the idea that capital inflows in financial systems that are not quite ready to handle them may hurt rather than help is a very important one. But perhaps it is an idea more relevant for emerging markets than for Portugal.

COMMENT BY

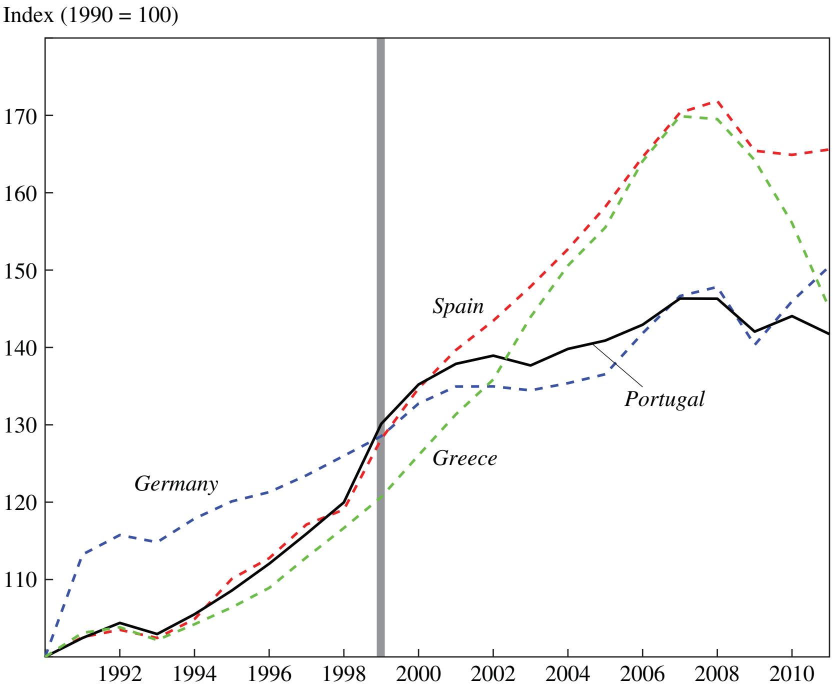
GITA GOPINATH The crisis-ridden economies of the euro area are looking for ways to resuscitate growth. During the period 1995–2007, economies such as Greece, Ireland, and Spain experienced rapid GDP growth, which then came to a sudden stop with the global financial crisis in 2008. In Portugal, on the other hand, growth stalled well before the financial crisis, as depicted in my figure 1.[1] Growth in GDP per capita in Portugal averaged 0.9 percent on an annualized basis between 1999 and 2007, well below the euro area average. A common feature across these economies before the crisis was that they ran current account deficits and were recipients of large capital inflows. Despite this, their growth experiences were very different. As these countries look for ways to stimulate growth, it is important to understand their individual growth experiences before the crisis.

This paper by Ricardo Reis is therefore very welcome, as it dissects the growth experience of Portugal from 1999 to the present. In addition, the paper offers an explanation for the slump in growth in Portugal, namely, misallocation of foreign capital inflows through an underdeveloped banking sector. The argument is that foreign capital inflows financed less productive firms in the nontradables sector, drawing resources away from more productive tradables sector firms, thus generating a decline in overall productivity and growth. Reis also points to an increase in labor and consumption taxes during this period (to finance social expenditure programs) that further aggravated the slump.

Since a lowering of international borrowing costs was an important consequence of the adoption of the euro for the smaller euro area economies, I begin my discussion by describing what one should expect to

1. This unique experience of Portugal was previously flagged by Blanchard (2007).

Figure 1. Real GDP in Germany, Greece, Portugal, and Spain, 1990–2011



Source: International Monetary Fund, International Financial Statistics.

be the response of the main macroeconomic variables following such a financial shock in an otherwise standard small open economy model. I then contrast the experience of Portugal with the predictions of the model. Finally, I evaluate some potential explanations for the differences between the observed and the predicted responses, including Reis's explanation based on misallocation and tax increases.

Overall, this paper provides a thought-provoking narrative of some important economic developments in Portugal that may have played a role in its decade-long slump and recent crisis. It also presents a simple model that highlights the role of weak financial institutions in misallocating international capital inflows and generating declines in total factor productivity (TFP). Although the narrative is suggestive that such misallocation might be an important factor, the paper offers little empirical evidence for that explanation. The arguments that minimize the role of labor market frictions and a real overvaluation are not very compelling. That said, the careful analysis in the paper provides a good starting point for future research on what afflicts growth in Portugal and other euro area economies.

A BENCHMARK SMALL OPEN ECONOMY I describe here a standard small open economy model. The model is familiar enough to macroeconomists that I will omit the equations and simply describe the ingredients and then graphically depict impulse responses to an interest rate shock. For a more detailed description of the model, see Emmanuel Farhi, Gopinath, and Oleg Itskhoki (2011).

The economy consists of households who consume, supply a differentiated variety of labor, hold money balances, invest in capital, and save or borrow using risk-free bonds denominated in the currency used in the country. The single good used for both consumption and investment is a constant-elasticity-of-substitution aggregator of goods produced at home and goods produced in the rest of the world, with a bias toward the former. Capital accumulation is subject to capital adjustment costs. The interest rate on risk-free bonds issued on date t and due at $t + 1$, i^*_{t+1}, is subject to the following law of motion:

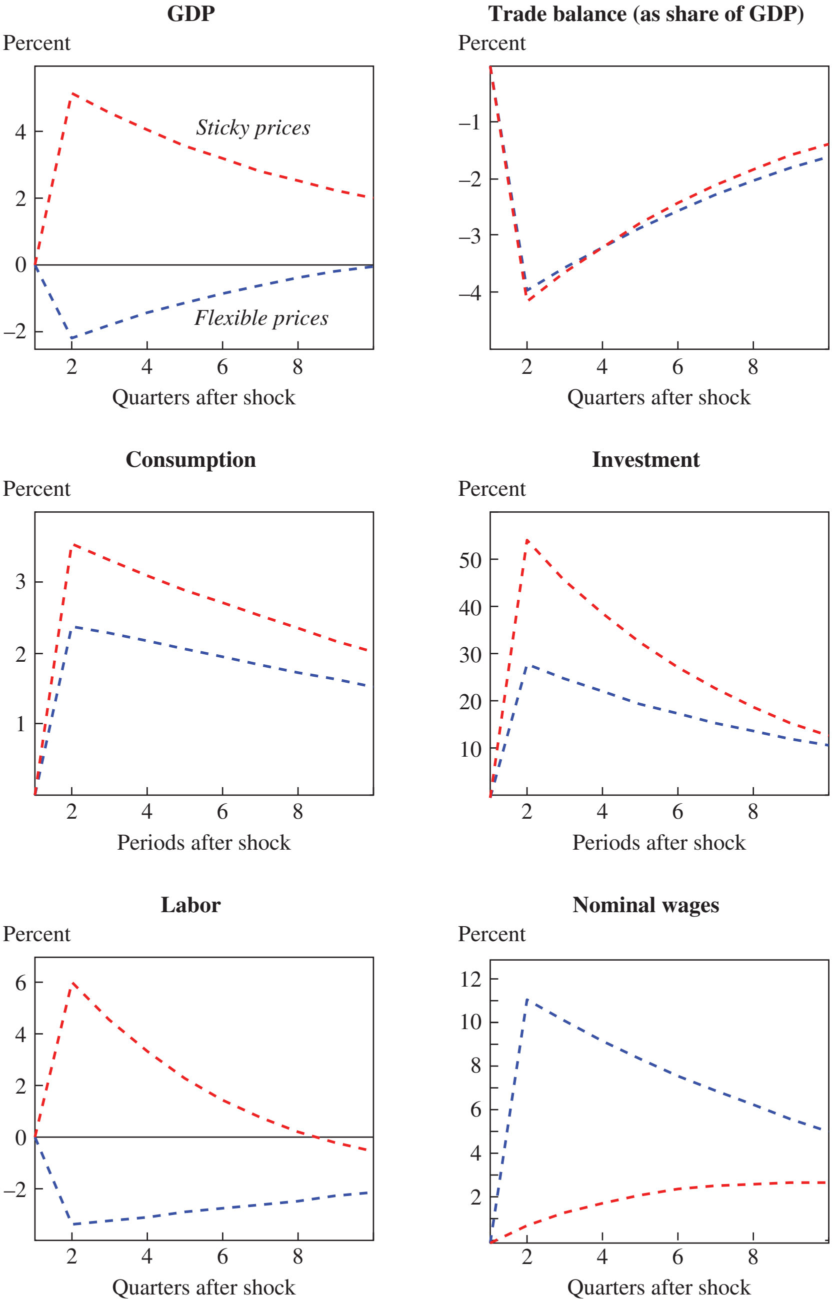
$$i^*_{t+1} = i^* + \psi(e^{B^* - B_{t+1}} - 1) + \varepsilon_{r,t},$$

where B^* is the steady-state debt, and $i^* = (1/\beta) - 1$. The shock to borrowing costs $\varepsilon_{r,t}$ is assumed to follow an AR(1) process with autocorrelation coefficient ρ_r.

Each producer in the economy produces a unique variety of good that is priced flexibly as a markup over marginal cost. The production function is Cobb-Douglas in labor and capital. The output of each firm is sold both domestically and to the rest of the world, and the law of one price holds. The government's budget constraint equates seigniorage to lump-sum tax transfers.

Figure 2 plots the impulse response to a mean-reverting decline in $\varepsilon_{r,t}$, both for the case of flexible wages and for the case of sticky wages. In this simple model a decline in international borrowing costs has a positive impact on consumption. This follows because the lower interest rate leads to an intertemporal substitution of consumption into the present. In addition, as Portugal is calibrated to be a net debtor at the time of the shock, the reduction in interest rates generates a positive wealth effect that reinforces the substitution effect, further increasing consumption. Similarly, investment increases as the opportunity cost of investing declines. The combination of an increase in consumption and investment generates a deterioration in the trade balance and the current account.

Figure 2. Impulse Responses to an Interest Rate Shock



Source: Author's calculations using the model described in the text.

The impact on output and labor depends importantly on the wage setting mechanism. The increase in consumption and investment, along with home bias, generates an increase in demand for domestic labor. On the supply side, in the case of flexible wages, the positive consumption effect reduces the supply of labor (for a given wage). On net, in the calibration the negative supply effect offsets the positive demand effect and generates a decline in labor and output in equilibrium. When wages are rigid, however, the labor supply response is less relevant, and the increase in labor demand generates an increase in employment and output.

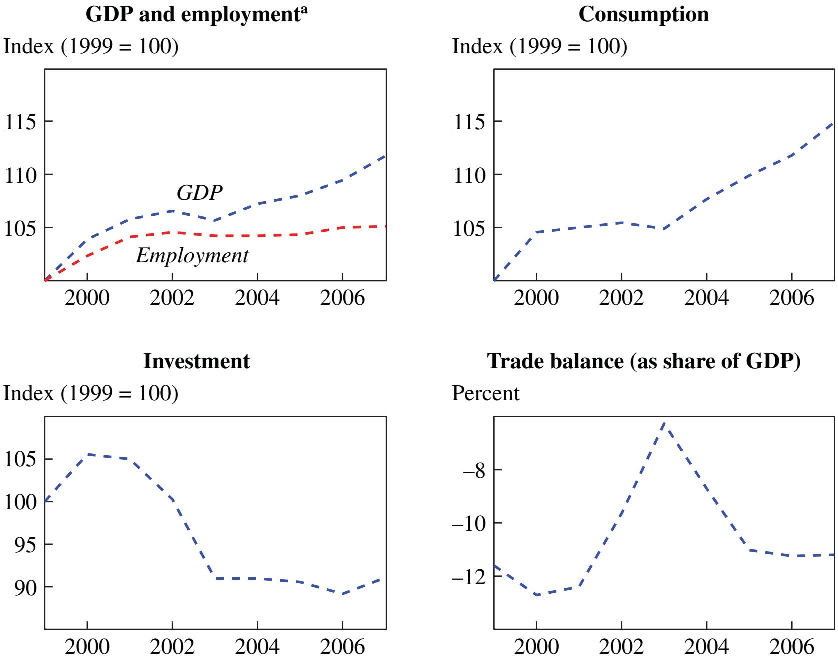
An implication of this analysis is that although a lower borrowing cost should generate an increase in consumption and investment and a deterioration of the trade balance, the implications for GDP and employment are more ambiguous and in this case depend on the extent of wage rigidity.

PORTUGAL RELATIVE TO THE BENCHMARK How does the experience of Portugal compare with the predictions of the benchmark model? The facts for Portugal for the period 1999–2007 are depicted in figure 3. Starting in 1999, GDP grew at an average rate of 1.39 percent on an annual basis (less in per capita terms), while consumption grew faster at 1.75 percent annually. The trade balance ran a large deficit, and TFP was stagnant. In qualitative terms the behavior of these variables is consistent with the predictions of the benchmark model. The one variable whose response is qualitatively different is investment. In Portugal, during the period when consumption was growing, investment declined (except for the initial year). It declined sharply in 2002 and 2003 (as is reflected in the improvement in the trade balance during those years). As a share of GDP, investment declined from 27 percent in 1999 to 22 percent in 2007, as depicted in figure 4. The negative trade balance and current account were therefore driven mainly by lower saving, both private and public, and not by higher investment. This trend decline in investment, which the paper does not address, strikes me as an important fact that needs to be reconciled with lower borrowing costs. A second discrepancy is the divergence (although small) in GDP growth and employment, especially toward the end of the period.

One could argue that even if qualitatively the evidence on GDP is consistent with the model, quantitatively the performance in Portugal was much worse. An implicit assumption in the paper is that TFP would have grown had it not been for the misallocation of financial capital. This is, however, an untested assumption.

EXPLANATIONS As I have mentioned, Reis's explanation for Portugal's slump involves a misallocation of international funds through an

Figure 3. Selected Macroeconomic Indicators in Portugal, 1999–2007[a]



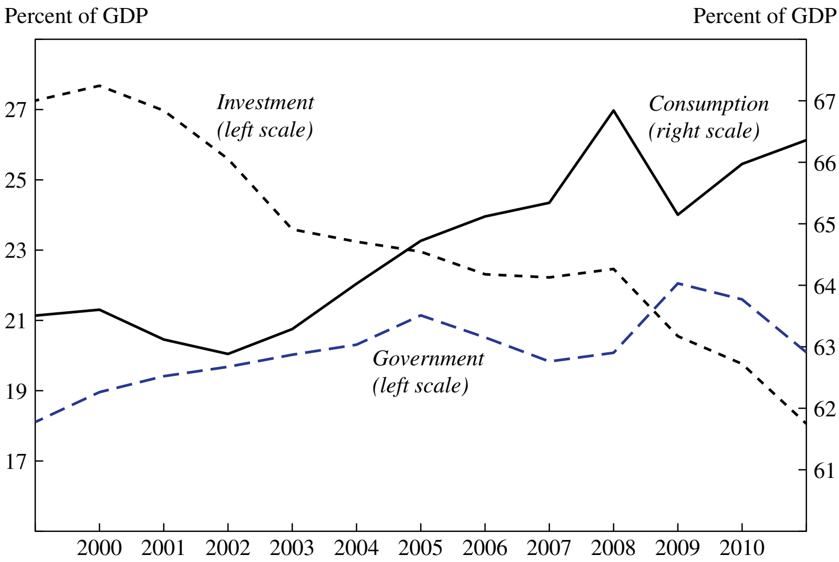
Source: International Monetary Fund, International Financial Statistics.
a. GDP, employment, consumption, and investment are in logarithms.

inefficient banking system, and an increase in labor taxes to finance social spending. I will address each in turn.

To isolate evidence of capital misallocation, one would need to correlate foreign financing (either direct or through the banking sector) with revenue-based TFP growth. In the paper the main evidence presented (in table 4) is that, at a highly aggregated level, the faster-growing sectors (those producing nontraded goods) were those whose TFP was shrinking the most.

A growing literature addresses allocation or misallocation of financial capital at the country level. Pierre-Olivier Gourinchas and Olivier Jeanne (forthcoming), Laura Alfaro, Sebnem Kalemli-Ozcan, and Vadym Volosovych (2011), and Mark Aguiar and Manuel Amador (2011) explore the relationship between country-level growth and capital flows. The evidence points to a positive relationship between private borrowing (including equity) and growth, and a negative relationship between government

Figure 4. Investment, Consumption, and Government Spending in Portugal, 1999–2011



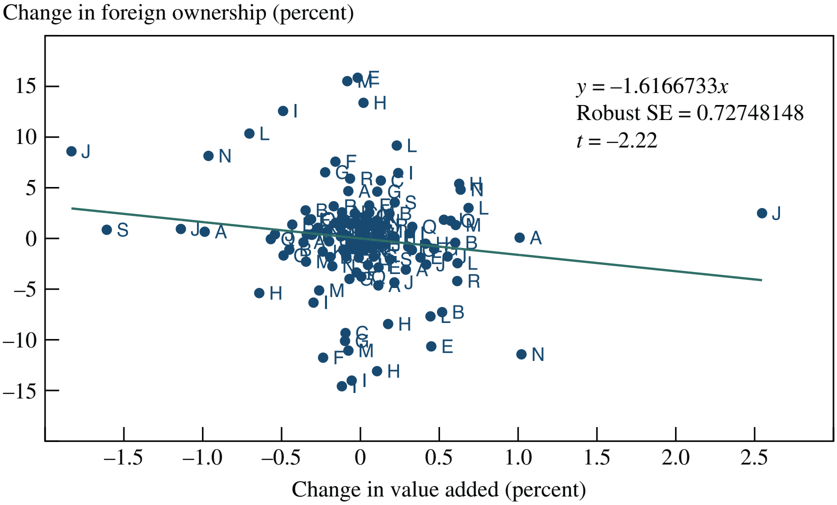
Source: International Monetary Fund, International Financial Statistics.

borrowing and growth. That is, the phenomenon of global imbalances, with fast-growing emerging markets like China being net exporters of financial capital, mainly captures the large reserve accumulation by the governments of these countries.

My own ongoing research with Kalemli-Ozcan, L. Karabarbounis, and C. Villegas-Sanchez (Gopinath and others, in preparation) uses firm-level data from the Amadeus database for the period 1998–2008 for 20 countries in Western and Eastern Europe to uncover the relationship between foreign financial flows and (revenue-based) TFP. At the country level we find evidence of a positive relationship between the change in the value of foreign private equity and growth in value added per worker; however, at the sectoral level (for a given country) we find a negative relationship between the two variables, suggestive of misallocation at that level. Figure 5 presents the evidence for Portugal. Whether this is indeed evidence of misallocation needs to be explored further.

The second factor that Reis points to in order to explain the Portuguese slump is the increase in taxes, mainly on labor and consumption, as reported in table 6 of the paper. The numbers in that table refer to tax

Figure 5. Partial Correlations between Foreign Ownership and Value Added in Portugal, 1998–2008[a]



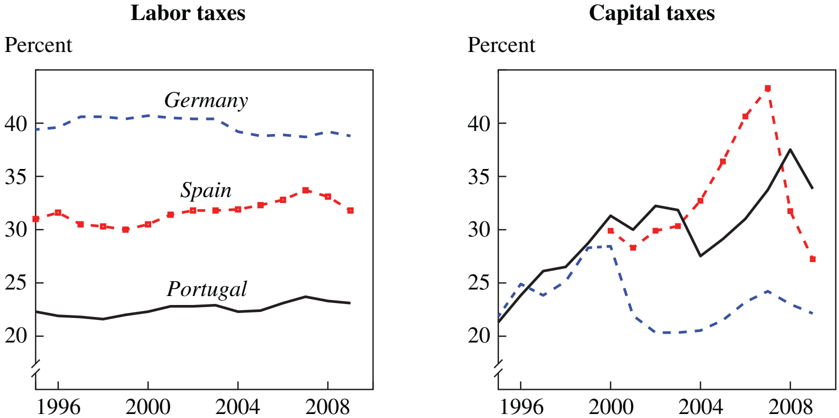
Source: Gopinath and others (2013).
a. Each observation corresponds to a single sector in the Portuguese economy in a single year.

revenue from each source as a ratio to GDP and therefore combine what happened to both the tax rates and the tax base. The fact that taxes raised from capital as a ratio to GDP declined during 2000–07 could reflect the decline in investment during these years.

My figure 6 plots effective tax rates on labor and capital in Portugal and, for comparison, in Germany and Spain, as reported by the European Commission (2011). The effective tax rate on labor in Portugal is much lower than that in the other two countries and shows very little change over time starting from 1995. The effective tax rate on capital, however, shows a steady increase over 1995–2003, followed by a temporary decline and then a further increase until 2009. Whether this increase in capital tax rates could be behind the slump in investment is worth exploring.

CONCLUSION This paper provides an insightful exposition of developments in Portugal over the last 15 years, covering the years of the slump and the ongoing crisis. The paper's model of misallocation of capital in an environment where firms are collateral constrained and banks have limited pledgeable capital will be useful for future research on the interaction between financial development and international capital flows. I expect to

Figure 6. Effective Tax Rates on Labor and Capital, Germany, Portugal, and Spain, 1995–2009



Source: European Commission (2011).

see more research in the future that aims to understand the factors behind weak growth in the euro area economies and that builds on the insights of this paper.

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GENERAL DISCUSSION While acknowledging that Reis's model was intended as merely illustrative, John Haltiwanger cautioned against using models in which the benchmark is a frictionless economy and the dispersion of firms by productivity, even within a given sector, is due to capital misallocation alone. It is well known that in countries like the United States, where economic distortions are relatively few, firms differ widely in productivity and in size even in narrowly defined sectors, for reasons having nothing to do with misallocation. For example, there can be curvature in the profit function due to decreasing returns to scale or product differentiation, and adjustment frictions may exist.

This matters, Haltiwanger continued, because in the United States at least, rapid growth in a sector is often accompanied by a wave of entry, and the entrants tend to be extremely dispersed in terms of productivity and growth rates. One expects eventually to see the low-productivity firms exit and the high-productivity firms grow and prosper, and indeed that is critical for whether the shift in the economy's sectoral composition is productivity enhancing. But for a time one may observe a greater dispersion of productivity among firms and possibly a leftward shift in the size distribution even as the sector grows. This, Haltiwanger suggested, might have happened in Portugal as well: the adoption of the euro may have prompted a sectoral shift into the tourism industry, but the shift may have faltered because of frictions in the economy.

Bradford DeLong recalled that almost exactly 19 years ago he had listened to Rudiger Dornbusch present a Brookings Paper on Mexico that Dornbusch had written with Alejandro Werner. Dornbusch had argued that although Mexico was a showcase of successful economic reform since the 1980s debt crisis, its macroeconomic stabilization strategy had led to an avalanche of capital inflows that went largely to finance consumption of imports and caused an overvaluation of the peso. This resulted in a lack of growth and a precarious financial situation. The paper had concluded by saying that a real depreciation was needed urgently to secure the benefits of Mexico's reforms. But the warning was ignored, and shortly thereafter, in December 1994, came the tequila crisis.

DeLong suggested that Portugal might have repeated some of that unfortunate history. A timely real depreciation would have been useful to help redirect capital inflows to more productive sectors. No matter how incompetent a country's financial sector is at intermediation, depreciation can by itself induce a shift in capital to the country's export industries. DeLong added that large capital inflows have caused problems not only in middle-income countries like Mexico and Portugal, but even in the United States in the 2000s, when such inflows led not to productive investment but to the building of lavish homes in the southwestern desert.

Warwick McKibbin argued that although the single European currency had brought with it a reduction in perceived country risk and a lower cost of borrowing, it had been put in place without two key supporting institutions: a banking union and a fiscal union with the possibility of fiscal transfers from stronger to weaker economies. When the crisis came, these countries could no longer adjust by allowing their currency to depreciate, and they could not expect strong financial or fiscal support from the European Union; given sticky wages, they had to suffer deep reductions in employment instead.

Kristin Forbes asked whether Reis could further explain why he thought Portugal had erred in allowing capital inflows to be allocated largely to what he called the "community and other services" sector. That sector importantly includes education and health services, most of which presumably go to middle- and lower-income households. According to all the developmental economics textbooks, those are precisely the activities into which investment should flow in order to raise productivity growth, although the improvement is seen only with a long lag. Why, then, had it been a mistake to follow this route in Portugal?

Caroline Hoxby returned to Olivier Blanchard's point that the optimism engendered by currency union had led to, among other things, higher pension commitments in Portugal and elsewhere. She pointed out that whereas wages are indeed famously sticky, pensions are even stickier, more difficult to adjust downward in a slump. She therefore wondered whether pensions might be a much larger part of the story than the paper suggested. For example, could much of the expansion in the community and other services sector, and especially in health care, have resulted from demand from seniors whose pensions were under pressure?

Frederic Mishkin suggested that Reis look more deeply, perhaps using firm-level data, into the reasons why the Portuguese banking system had failed to allocate capital efficiently. Another question worth investigating, he thought, was why economic integration had not led to more foreign banks entering Portugal. Foreign entrants might have done a better job of intermediation than the domestic banks, and the competition they would have provided might have forced the domestic banks to improve. It had been widely hoped that the arrival of the single currency would lead to an integrated European financial market, but whether because of nationalism or for some other reason, that did not happen.

Richard Cooper noted that capital flows are typically measured on a net basis, as the capital or current account balance, but he suspected that a decomposition of the gross flows was an important part of the analysis in Portugal. The paper took it as given that most of the inflows came in via the banking system, but Cooper wondered whether in fact that was the case. And if it was, was it mainly Portuguese banks borrowing capital from abroad, or was it foreign banks entering, looking for opportunities? What share of the inflows came as direct investment? How much took the form of asset purchases by households and foundations?

Responding to Forbes, Cooper pointed out that national accounts statisticians typically assume annual productivity growth in the education sector to be zero. He doubted that much of the capital inflow in Portugal did in fact go into education, but if it did, it could be part of the story, and he thought it worthwhile to look elsewhere within the community and other services sector to see whether other parts of it are also simply assumed to have zero productivity growth.

Liliana Rojas-Suárez agreed with DeLong that much about Portugal's recent experience was not new. Europe's crisis, like so many in the past, had been fueled by underpricing of risk, due in the European case to an implicit guarantee by the European Union. Indeed, the prerequisites for a successful financial liberalization had been established by academic work in the 1980s and by work at the International Monetary Fund in the early 1990s. What was new in the crises of the late 1990s and 2000s—and in Rojas-Suárez's view insufficiently recognized—was the role of international regulation, and in particular the capital requirements established by the Basel Committee. In these more recent crises, when banks started to encounter problems with nonperforming private sector loans, and their equity capital began to decrease, they were obliged under Basel to replenish capital to maintain the required capital-to-assets ratio. But capital is costly from a bank's perspective, and meanwhile the risk-weighted capital ratios established under Basel assigned government debt a weight of zero. This gave the banks a strong incentive to shift to holding government debt rather than private sector debt, because they could do so without raising additional capital. Unfortunately, the resulting shortfall of lending to the private sector tended to worsen overall economic conditions, thus reducing the quality even of the supposedly safer government debt, and banks' balance sheets deteriorated further. The effects of this perverse incentive caused by the Basel regulations were visible in the experiences of Argentina and Turkey in the 1990s, for example, and Rojas-Suárez suggested that they could be part of Portugal's story as well.

Returning to the role of the community and other services sector, Abebe Selassie pointed out that much delivery of public services in Portugal in the 2000s had been funded off the government's balance sheet, through public-private partnerships. This activity—for example, in health services and perhaps in road construction—was thus publicly commissioned but classified for national accounts purposes as private investment. As the crisis unfolded, however, and the private sector companies doing this work went bankrupt, their debts migrated to the sovereign balance sheet, as they were in effect contingent liabilities of the public sector.

Steven Davis remarked that the paper itself and most of the discussion seemed to assume that the blame for Portugal's problems lay with the financial sector. That could well be the case, he said, but in principle at least, the fault could lie elsewhere. If, for example, there were barriers to competition that sustained the profitability of less productive firms, then bank lending to these firms, although a misallocation from a macroeconomic perspective, could have been rational and profit maximizing from the banks' point of view ex ante.

Robert Gordon suggested that the paper could benefit from taking a somewhat longer time horizon, starting from the 1990s rather than 2000. To him the puzzle was not why Portuguese GDP had grown so slowly in the 2000s, but why it had done so after outpacing Germany in the previous decade. He also proposed comparing Portugal's recent experience with that of Italy, which was in some ways similar and on which a large literature has emerged. In particular, Gordon noted, this literature has found that Italian manufacturing has been decimated by Chinese competition. Might there have been a comparable impact on Portugal?

Gordon observed further that the conventional starting date for analysis of the productivity problem in southern Europe was 1995, not 2000. Since 1995, productivity growth has been slower in southern Europe than in the United States, but both aggregate hours of work and hours per worker have grown substantially faster than in the United States. For Italy and Spain it has been shown that the weaker productivity performance is due to a compositional effect of new, inexperienced workers—mainly women and unskilled immigrants—entering the labor force. Capital inflows, however, have been much more important in Portugal than in Italy.

Responding to the discussion, Ricardo Reis agreed that much could be learned from extending his study either backward to the 1990s or forward to the crisis years. But he had chosen to focus on the 2000-07 period precisely because Portugal's experience in those years differed so starkly from that in most other European countries. Many countries, including

Portugal, had seen booms of varying intensity in the 1990s, and many had suffered crashes along with Portugal in 2010 and after, but within Europe, only Portugal had experienced stagnation during 2000-07. He sided with Rojas-Suárez, DeLong, and the others who viewed Portugal's crash as a typical example of a "sudden stop" of capital inflows. But whereas in the other "sudden stop" countries the crash was usually preceded by a boom, in Portugal it had been preceded by a slump. That difference, Reis thought, needed explaining, and he believed the misallocation of capital in Portugal during the early 2000s was an important part of the explanation.

Reis also reiterated his belief that the banks were central to understanding that misallocation: more than half of Portugal's net foreign assets during the period in question had entered through the banking system. He had written extensively elsewhere about the "diabolic loop" between sovereigns and banks in the European crisis and therefore had not addressed it fully in the paper, but he thought it was key to explaining the crisis in Portugal and elsewhere. Gita Gopinath's data, Reis noted, related largely to foreign direct investment, and although the patterns for direct investment might correlate with those for capital flows generally, direct investment was only a small part of the story in Portugal.

Reis sought to correct any misimpression that he thought that all of the misallocated capital had gone to the community and other services sector. Wholesale and retail trade had also taken a large share. Within that sector, and specifically within education, Reis observed, the number of teachers employed had remained relatively stable during the period but their wages had risen, causing total education spending to rise. In health care an important development was widespread privatization: privately run hospitals appeared in Portugal for the first time during this period. Ultimately this showed up as government spending, because the government pays the private providers for health care, and thus Selassie was right that the public-private distinction was blurred. But Reis thought that for his purposes, whether the activity was public or private was less important than whether they were productive, and thus whether they represented an appropriate use of capital inflows. In fact, after a short spell of outperformance relative to the public hospitals, the new public-private hospitals experienced low to negative productivity growth. In the end he thought that they accounted for a larger share of the weakness in the community and other services sector than did education.