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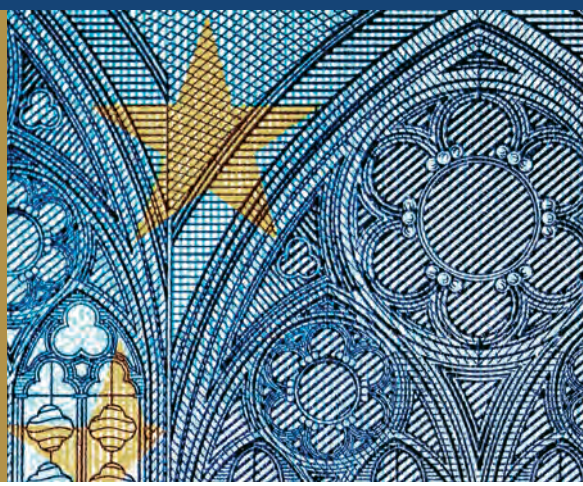

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ISSUE FOR DISCUSSION

I

SEGMENTATION

SEGMENTATION*

*Mário Centeno** | Alvaro A. Novo***

ABSTRACT

Segmentation is at the core of the problems that affect the Portuguese labor market. The ever increasing number of workers with temporary contracts, already above one fifth of salaried workers, shares the larger burden of the unavoidable and continuous adjustments of the economy. In general, segmented markets are ineffcient; the stronger side of the market corners rents at the cost of the weak side. In labor markets, where the product transacted has independent will, the maladies of segmentation are only worse. The continuous rotation of certain workers and their comparatively lower wages generate a vicious cycle of underinvestment in education and training that traps the economy at a low-productivity equilibrium. The long-term success of the Portuguese economy rests on breaking this vicious cycle. Forming a modern labor market supported on market-based reputation mechanisms and simplifying labor relations under a single contract is the only way out and up.

1. Introduction

"In Italy, Spain, and France, the labour market is split. The young are hired with temporary contracts which offer no social security and no prospects. When the contract expires, the employer opts not to renew it, so as not to run the risk of having to convert temporary hires into permanent employees who would de facto immediately acquire the right never to be fired. Reforms that eliminate this duality by making the entire labour market flexible with an appropriate scheme of unemployment compensation would not only reduce unemployment but, most importantly, would favour the really poor and the young entry-level workers. This is an example of a pro-market policy that favours the poor."

Alberto Alesina (Harvard U.) and Francesco Giavazzi (Bocconi U.)

in The Future of Europe

One could hardly find a better description of the effects of segmentation on the Portuguese labor than that put forward by the two Italian economists. From an economic perspective, segmentation is the result of restrictions imposed on the labor market functioning that drive it away from an effcient equilibrium. One in which workers and firms would be matched to maximize job match productivity, at a clearing wage that reflects the existence of effciency wages (wages that promote productivity growth). In this sense, labor markets are not (and should not) be characterized by spot market outcomes and wages paid are not exactly equal to the marginal productivity of the worker (Katz 1986).

The Portuguese economy shares the same problems and walls surrounding the labor market. Reducing the access to jobs, fencing workers and firms within the meanders of an intrusive legislation that distorts

* The authors thank Nuno Alves, Ana Cristina Leal and José F. Maria for their comments and the help of Lucena Vieira with the treatment of full data sets and computations using *Inquérito ao Emprego*. The opinions expressed in the article are those of the authors and do not necessarily coincide with those of the Banco de Portugal or the Eurosystem. Any errors and omissions are the sole responsibility of the authors.

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agents' incentives. The current degree of segmentation developed as a malaise for our labor market. It was self-inflicted by decades of wrongly designed employment protection, unemployment insurance and active labor market policies (Boeri 2010). Segmentation penalizes investments in education, technology and promotes emigration. Precisely the three main drivers of economic growth and development (Goldin and Katz 2008).

A country caught in a segmented labor market enters a vicious cycle of low returns to human capital and poor match productivity, which deliver low wages and low potential growth. Portugal was too slow to understand that such a disaster was imminent. Convinced that employment protection would do the trick for workers and that fixed-term contracts would do the trick for firms, reforms of the Portuguese labor market only increased its segmentation traits.

The idea that Portugal was characterized by too low labor market flows was at the basis of several reforms of the employment protection legislation. These reforms increased flexibility through fixed-term contracts, leaving unchanged the regulation of permanent jobs. A two-tier system was created and segmentation promoted (Boeri 2010).

The conviction that the minimum wage policy was effective to reduce poverty raised effective entry barriers to an already segmented cohort (Freeman 1996). Most workers in this cohort end up in the ranks of those who are involved in a process of endless churning through jobs with frequent unemployment spells. A vacancy chain promoted by the creation and destruction of a succession of fixed-term contracts used to fill matches in segmented markets.

The idea that more centralized wage setting institutions would deliver an equalized wage distribution overlooked the role played by education and market forces in shaping the returns in the labor market (Autor, Katz and Kearney 2008). Despite being ranked as a highly centralized labor market, Portugal has one the highest degrees of inequality among European economies (Alves, Centeno and Novo 2010). The low wage mobility is another undesirable feature of segmentation.

Faced with long-term unemployment and the emergence of youth unemployment, European countries increased spending in sizeable wage subsidies aimed at stimulating employment. Again, these policies increase segmentation and have disappointing evaluations in terms of its effectiveness to promote the return to work of unemployed workers (Kluve 2010).

In Portugal, permanent contracts enjoy large returns to tenure and fixed-term contracts bear the quantity and price adjustment costs in the labor market. But the set of workers on fixed-term contracts is much more educated and talented; the youngest cohorts of our economy.

We present causal evidence of the effects of segmentation on the firm's personnel policy, showing that the instituted competition among substitutable open-ended and fixed-term contracts has an negative impact on employment stability of Portuguese workers. A reform path is suggested to eliminate the main traits of segmentation.

2. Two-tier systems and segmentation

The rotation of workers is a natural process in the labor market. Actually, natural may be an understatement if not understood as resulting from a process of optimization. Both firms and workers are continuously evaluating the quality of the matches formed, redefining the match's characteristics (productivity; wages, fringe benefits, etc.) and even looking for better matches (on-the-job search).

This process of mobility is the result of an investment decision, similar to any economic investment. In both cases, there is an expected *ex-ante* return that may come to fruition or not. Jovanovic (1979) defined a labor market match as an "experience good", in the sense that the only way to determine its quality is to form the match and "experience it". Through this experiencing, firm and worker learn

about the match quality; if the expected benefits exceed the expected costs, the relationship continues, but otherwise they will decide to change labor market partner. These decisions vary from firm to firm and from worker to worker. For instance, some firms have higher turnover costs; some skills are easier to observe and, therefore, more likely to be matched successfully; and the frequency of technological changes varies across firms. The same is true for workers. They have ambitions and expectations regarding the return to their investments on human capital. The more educated workers, because they made more expensive investments, will not be stuck in low-productivity matches, aiming instead for better matches. All these factors affect the optimal turnover.Optimally sorting jobs and worker to produce more productive matches does not generate segmentation in the labor market. It allows workers to fulfill their skills potential and firms to maximize their investments.

But factors external to both the firm and the worker also affect the personnel policy of firms and the willingness of workers to keep searching for better job opportunities. A key element of the institutional setting is the degree of employment protection, which varies by contract type. In the majority of developed countries, with the typical exception of Anglo-Saxon countries, open-ended contracts (used to) confer a high degree of employment protection. Workers on an open-ended contract are protected through hard-to-meet firing criteria and high severance payments. This perception of a strong protection of open-ended contracts led to the introduction of reforms aimed at increasing flexibility in the labor market. The most common reform was the introduction of fixed-term contracts, with lower dismissal costs, both procedural and financial (Boeri 2010). Unfortunately, these were partial reforms that did not reach all workers and without an integrated and complete perspective of labor market policies. The most damaging mistake was to leave untouched the regulation of open-ended contracts, generating a protection gap between the two types of contracts. As a result, two-tier systems split the labor market and spread unevenly the composition of job and worker flows among the two types of contracts. These features also introduced barriers to optimal investment decisions by firms and workers, trapping agents in suboptimal equilibria.

As two-tier systems unfolded in many economies, labor economists started dedicating increasing attention to these systems with a mix of theoretical and empirical analysis (Abowd, Corbel and Kramarz (1999), Boeri (2010), Bentolila, Cahuc, Dolado and Le Barbanchon (2010) and Cahuc, Charlot and Malherbet (2012)). Theoretical models start by assuming that, in the initial investment period, all entry-level jobs are fixed-term contracts. Then, some of these contracts are converted into open-ended contracts. The conversion of matches into more permanent labor relationships is heterogeneous, as is the success rate of any investment decision. It depends on the productive characteristics of the match; for instance, in some sectors it is easier to observe *ex-ante* the characteristics of the firm (production process; remuneration policies) and of the worker (specific training), rendering the match less of an experience good. But the conversion rate depends also on non-productive characteristics of the match, such as the institutional arrangement regulating labor contracts. The employment protection gap places a wedge in the choice of the contract type and, later on, in the conversion of temporary contracts on open-ended.

These models predict that an increase in the employment protection for incumbents (under open-ended contracts) decreases the conversion of temporary jobs into permanent ones (Table 1, column(1)). This implies an increase in the share of fixed-term contracts for entry-level jobs and in their excess turnover rates. The notion of excess worker turnover captures the idea that, for filling a new job, the firm does not simply hire one worker; on the contrary, it hires and separates from a number of workers in excess of what would be necessary to expand its employment level. A similar process may occur to reduce the employment level. However optimal the search for a better match, the two-tier nature of the labor market imposes a negative spillover upon workers with fixed-term contracts. At the same time, the increase in the protection gap will also imply a reduction in the job loss rate of open-ended contracts, but will have an ambiguous impact on the excess worker turnover of open-ended contracts, as accessions into permanent jobs are also reduced. These reforms are the main driver of segmentation in the labor market.

Table 1

THE IMPACT OF TWO-TIER REFORMS			
Increase in the	Employment protection for permanent jobs	UI replacement rate	Employment subsidies for entry jobs
	(1)	(2)	(3)
Job loss rate (from entry jobs)	+	0	+
Job loss rate (from continuing jobs)	-	+	0
Job finding rate	+	0	+
Premium on permanent contracts	+	+	+
Conversion temporary to permanent	-	+	-
Entry jobs as % of total employment	+	+	+

Source: Boeri (2010).

Boeri (2010) analyses the impact of two-tier reforms in two additional policy areas. An increase in the replacement rate of the unemployment insurance system and an increase in the employment subsidies for entry jobs.

A reform of the unemployment insurance system that increases the generosity of the system for eligible workers (those with longer labor market attachment) will not have an impact in the job loss or the job finding rate from temporary contracts (Table 1, column(2)). However, the share of temporary contracts will increase, as a result of the higher job loss rate from existing contracts (as the cost of job loss for these workers is now lower). These reforms generate segmentation because of the later effect.

An increase in the wage subsidies for entry jobs will have an impact quite similar to the one obtained with a larger employment protection gap (Table 1, column(3)). The direct impact on temporary jobs is an increase in the job loss and job finding rates. This policy reduces the conversion rate of temporary to permanent jobs. This happens because there is an increased incentive for firms to replace workers whose wage subsidy expires by newly hired workers that may be eligible to receive a subsidy. This increases the asymmetry between the two types of contracts (as permanent workers are typically not subsidized). Finally, the share of workers under fixed-term contracts increases, as does the wage penalty of short-term jobs, which is the result of the increase instability of temporary employment.

It is important to understand that the optimal decisions of firms and workers will always result in some level of excess worker turnover. However, the key issue in labor markets in which substitutable contracts are offered concurrently is the role played by each type of contract in the ability of firms to reach their desired level of workers rotation. In other words, one must understand that a non-productive characteristic of the matches influences the burden of adjustment shared by otherwise similarly productive workers. This outcome of two-tier systems is highly ineffcient.

Furthermore, two-tier systems distort the incentives of firms and workers in their quest for better matches. For workers, a split labor market reduces the incentives to invest on human capital because good matches are hard to find, most entry jobs are temporary and have low conversion rates. For firms, in a context of high uncertainty and poor economic prospects (demand), there are also limited incentives to invest in better matches. Therefore, jobs are offered on temporary contracts with low invest on specific training. Overall, this hinders the creation of higher quality matches, generating a vicious cycle of suboptimal investment that perpetuates a low-quality equilibrium.

3. The Portuguese labor market: characteristics of a segmented market

The use of data unfit to compute job and worker flows has led the economic profession to systematically underestimate the meanders of two-tier labor systems and the damage caused to the effciency of labor market outcomes. Only too recently has the jargon "segmentation" become part of the lexicon of labor economists. And, nowadays, of policy makers and the public in general.

Fortunately, the advances in computational power and the parallel development of comprehensive data sources has filled an important informational gap in the analysis of the labor market: job and worker flows. We can now answer questions that are of the utmost importance to understand the labor market and design better policies.

How frequently do firms adjust their employment level? And how many workers are involved in this process? Does expanding one employment position require the hiring of only one worker? Or does the firm try several workers before settling for a more permanent match, resulting in excess worker turnover? Which workers are most often involved in these flows? Is the adjustment spread evenly across workers or is there segmentation? Without answering these questions, we cannot diagnose and prescribe solutions to the current dire state of the Portuguese labor market.

3.1. Unemployment, employment and fixed-term contracts

The latest unemployment figures available for Portugal are worrisome: 14% of the population who wants and is available to work is unemployed (Table 2). The contrast with the not so distant past is striking. Until the late 90s, the unemployment rate showed a pronounced cyclical behavior, reaching unusual low levels, around 4%, from 1998 to 2001 (Chart 1). Along this period, the natural unemployment rate remained stable, hoovering around 5.5% (Chart 1). But as the economy was hit by shocks, its economic structure revealed itself incapable of adjusting swiftly and the natural rate of unemployment has been increasing steadily. The structural nature of unemployment questions the capability of the economy to reduce the unemployment rate beyond the standard effects of a positive turn in the economic cycle. To engage in a more profound change that brings the unemployment rate to levels socially acceptable, the country needs deep structural reforms in the labor and product markets. Eliminating the duality of the labor market stands out.

Even in the rosier years, the Portuguese labor was characterized by a large share of long-term unemployed; around 40% of the unemployed had been looking for a job for at least 12 months. To different degrees, the culprits are the low educational levels of most unemployed workers, one of the most generous systems of unemployment insurance in Europe and the asymmetric degree of employment protection across contracts. In 2006, long-term unemployment exceeded 50%, to fall in the acute phase of the 2009 recession due to the large inflows into unemployment from job destruction and increased again recently.

Table 2

LABOR MARKET EVOLUTION

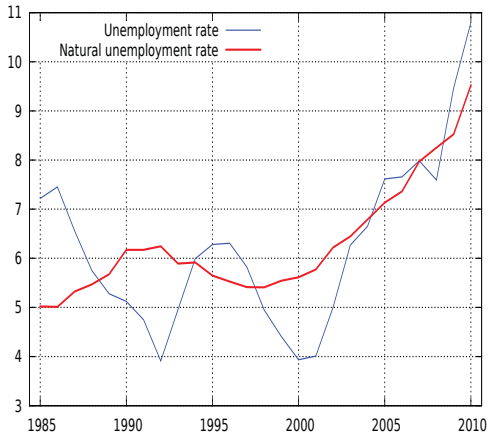
	1998:Q1	98:Q1 01:Q3	2001:Q4	01:Q4 06:Q3	2006:Q4	06:Q4 08:Q4	2009:Q1	09:Q1 11:Q4	2011:Q4
Unemployment rate	4.5		4.1		7.5		8.9		14.0
Fixed-term employment[a]	11.6		15.8		16.9		17.7		17.6
Self-employment rate[b]	26.1		25		22.5		22.9		20.3
Long-term unemployment[c]			38.4		50.2		44.0		49.8
Share of fixed-term hires[d]		76.7		85.1		88.9		88.4	
Share of fixed-term separations[e]		63.7		64.2		67.8		64.1	
Growth rates:									
Labor force		1.44		0.23		0.03		-0.10	
Employment		1.84		0.02		0.08		-0.56	
Real wages[f]		2.38		0.08		0.26		-0.37	
Gross domestic product		3.91		0.78		1.18		-0.73	

Source: *INE* (*Inquérito ao Emprego* e *Contas Nacionais*) and authors' calculations.

Notes: All values in percent. Employment variables based on the Labor Force Survey. Real wages and gross domestic product based on National Accounts and Banco de Portugal. **(a)** As a share of employees. **(b)** As a share of total employment. **(c)** Percentage of unemployed workers with spells of 12 or more months. **(d)** Percentage of new hires on fixed-term contracts from unemployment. **(e)** Percentage of newly unemployed workers that had been employed on fixed-term contracts. in the previous quarter. **(f)** Full-time equivalent.

Chart 1

EMPLOYMENT | 1985-2010



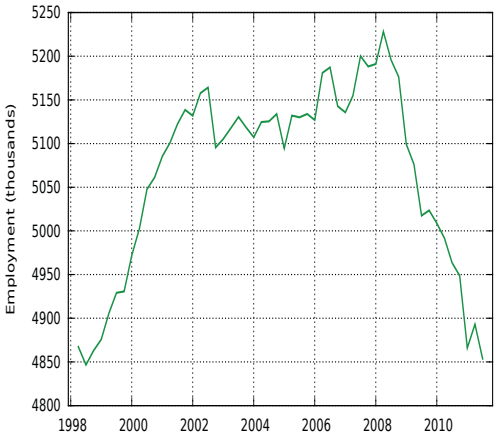
Source: *INE* (*Inquérito ao Emprego*), Centeno, Maria and Novo (2009).

From 1998 to 2001, aggregate real wages and output were growing at appreciable rates, 2.4% and 3.9%, respectively (Table 2). However, since 2001, the significant slowdown in total factor productivity and potential output growth led to a stagnant economy – gross domestic product has been growing at extremely low rates. In tandem with this lackluster performance and the associated increase in the unemployment rate, aggregate real wages have barely grown. This pro-cyclical behavior of wages is a well-know feature of the Portuguese economy, which will help in the adjustment process (Carneiro, Guimar˜aes and Portugal 2009, Martins, Solon and Thomas 2010). Again, the larger share of the adjustment burden will fall on new hires, which are also mostly made on fixed-term contracts.

The decline in employment is at least as dramatic as the steep increase in the unemployment rate, both grounded on structural and cyclical factors. Employment losses since 2009 have wiped out all gains from the previous 10 years (Chart 2). Also, on average, the labor force – employment plus unemployment – has declined 0.1%, each quarter. Never in the last three decades did the Portuguese labor market observed consistent reductions in its labor supply. Part of the explanation may lay on the concentration of the

Chart 2

EMPLOYMENT | 1985-2010



Source: *INE* (*Inquérito ao Emprego*).

strong destruction of employment in specific groups and sectors, discouraging these workers to the point of driving them out the labor market. At the extreme, it may even encourage qualified workers to migrate, emptying the inflow of the late 90s. The strong ability of the economy to destroy employment and the large swings in employment is one of the main characteristics of segmentation.

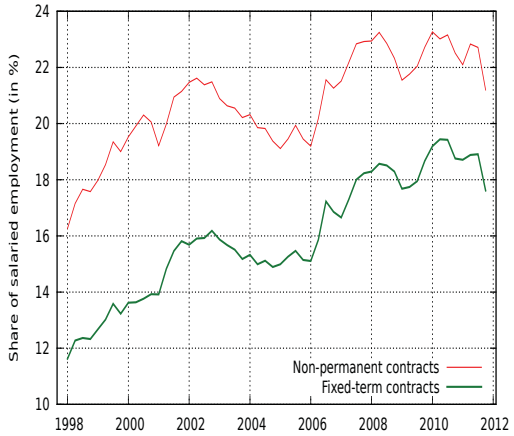
Fixed-term contracts and other forms of temporary contractual arrangements are at the core of two-tier labor markets. As it will be demonstrated in section 4, the higher the employment protection gap between open-ended and fixed-term contracts, the higher the incidence of more flexible contracts, and consequently the higher the degree of segmentation. The most recent information shows an unequivocal increase in the share of workers covered by temporary contracts. Chart 3 plots the share of all salaried workers that have a fixed-term contract, which increased from around 12% in 1998 to around 18% in 2011. The inclusion of other temporary contracts raises the percentage to above one-fifth of all salaried workers.

This upward trend results from the very large share of entry jobs with a temporary contract. Chart 4 shows, for each quarter, the percentage of hired unemployed workers with a fixed-term contract. The share increased throughout the period, going from values around 72% in 1998 to figures close to 90% in 2010. Complementarily, chart 5 shows that the majority of workers that become unemployed each quarter, about two-thirds, had a fixed-term contract. Comparatively with the early years, there is a slight increase in this share in the years around the current crisis.

The financial and the sovereign debt crises ended the period of easy access to cheap credit and generous state subsidies that fuelled ineffcient allocations of resources. The new economic order has forced firms to readjust their production processes. The lower firing costs of fixed-term contracts, particularly in terms of procedural costs, which are absent at the end of the contract, facilitate the adjustment process. However, the burden falls upon a segment of the labor market. Bentolila *et al*. (2010) report a similar pattern of adjustment in Spain. The fact that the incidence of fixed-term contracts is particularly high among entry jobs results in significant heterogeneity across demographic groups. Chart 6 shows that around half of all workers with less than 25 years are employed under a fixed-term contract. This percentage falls monotonically with age, reaching 10% at age 40. Over time, with the increase in segmentation, this pattern became clearer.

Chart 3

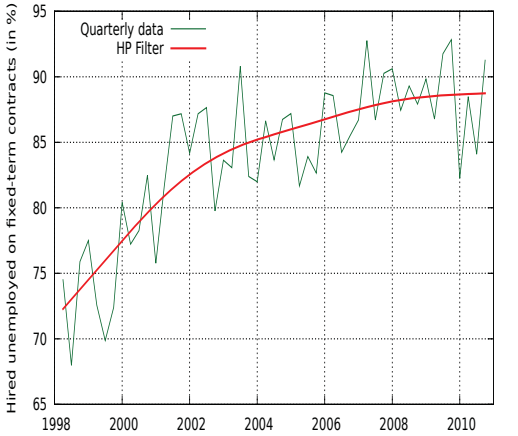
SHARE OF FIXED-TERM AND NON-PERMANENT CONTRACTS | 1998-2011



Source: *INE* (*Inquérito ao Emprego*).

Chart 4

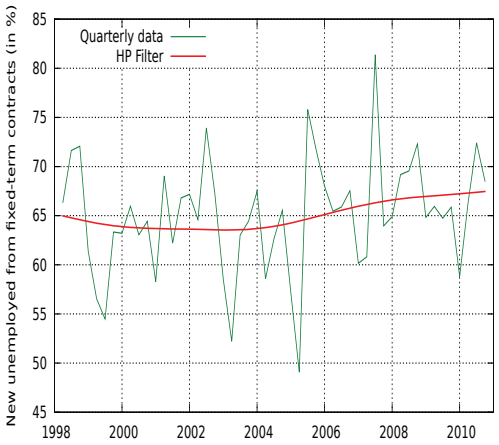
PERCENTAGE OF UNEMPLOYED WORKERS HIRED, EACH QUARTER, ON FIXED TERMCONTRACTS | 1998-2010



Source: *INE* (*Inquérito ao Emprego*).

Chart 5

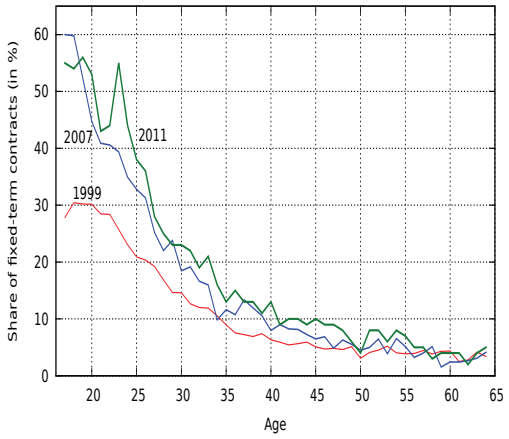
PERCENTAGE OF NEWLY UNEMPLOYED WORKERS THAT HAD BEEN EMPLOYED ON FIXED-TERM CONTRACTS IN THE PREVIOUS QUARTER | 1998-2010



Source: *INE* (*Inquérito ao Emprego*).

Chart 6

PERCENTAGE OF WORKERS HIRED ON FIXED TERM CONTRACTS BY AGE | 1999, 2007 AND 2011



Source: *INE* (*Inquérito ao Emprego*).

3.2. Job and worker flows

The success of an economy rests not only upon its capacity to innovate, but also on the capacity to adjust to the myriad of shocks that constantly hit its productive processes. This is Joshep Schumpeter's seminal legacy to economics, which we all know as *creative destruction*. It is the process that explains why local bookstores had to adjust to the advent of online bookstores and are now facing aggressive competition by digital books (*ebooks*) providers, driving many out of business. But it also explains why governments should not subsidize firms threatened by the very nature of technological innovation and the competitive nature of market economies. It is far more important to understand the process of job and worker flows originated by creative destruction and to devise mechanisms to smooth transitions, both for firms and workers.

Aggregate flows

Following best practices in labor economics (*e.g.* Anderson and Meyer 1994, Lalive 2008), we compute annual and quarterly flows based on Social Security employment registers. The Portuguese Social Security Bureau keeps a census of private and public sector employer-employee matches (it excludes only firms with individual pension funds and civil servants covered by *Caixa Geral de Aposentações*). The nature of the information, self-declared wages subject to mandatory contributions to the Portuguese Social Security system, and the short-term availability (with a lag of less than two months), make the dataset a unique source of information on labor market developments. It registers, not only wages, but all social and unemployment related financial transfers paid to workers by the Social Security system. The data cover the period from January 2000 to December 2009.

Table 3 shows the rates of job creation and destruction, as well as the rates of hirings and separations of workers for all firms in the economy. The exact definitions of these concepts are provided in the Appendix, but intuitively job creation measures the net employment gains of expanding firms. Similarly, the rate of job destruction measures the percentage of net employment losses of contracting firms. Hirings correspond to new matches and separations to destroyed matches. In Portugal, during this period, the average rate of annual job creation is 12.7% and the destruction rate is 11.9%. However, to achieve

Table 3

ANNUAL JOB AND WORKER FLOWS IN PORTUGAL AND THE UNITED STATES

	Job criation	Hiring	Job destruction	Separation	Ratio Hiring/JC	Ratio Separation/JD
	(1)	(2)	(3)	(4)	(5)	(6)
			Annual			
Portugal (2001-2009)	12.7	25.2	11.9	24.5	2.0	2.1
Portugal (2001-2006)	12.8	25.4	12.0	24.7	2.0	2.1
USA (2001-2006)	14.6	28.5	13.7	28.0	2.0	2.0
Ratio PT/USA (2001-2006)	0.88	0.89	0.88	0.88		
			Quarterly			
Portugal (2001:Q1-2009:Q4)	5.0	9.2	4.9	9.0	1.8	1.8
Portugal (2001:Q1-2006:Q4)	5.2	9.4	5.0	9.2	1.8	1.8
USA (2001:Q1-2006:Q4)	7.9	14.9	7.6	14.8		
Ratio PT/USA (2001:Q1-2006:Q4)	0.66	0.63	0.66	0.62		

Sources: Portugal: Social Security. US: The job flows are based on BED, covering all private establishments (Davis, Faberman and Haltiwanger 2006). The quarterly data cover the 1990:2-2005:1 period; the annual datacover 1998-2002. The workers flows are based on JOLTS with the adjustments introduced in Davis. Faberman, Haltiwanger and Rucker (2010) to aproximate the firm demography based on the BED.

these rates of creation and destruction of jobs, firms engaged in much larger flows of entry and exit of workers. In aggregate terms, annual worker flows are around twice the number of job flows (25%, on average). In other words, for each 100 new jobs created by expanding firms there are approximately 200 hirings in the total economy. Similarly, for each 100 jobs destroyed by contracting firms, 200 separations are observed in total. These ratios between worker and job flows, which yield a 2-to-1 rule, can be used as a measure of excess worker turnover (columns (5) and (6)).

But annual flows underestimate the amount of labor force turnover that occurs each year. For instance, a worker hired on a six-month fixed-term contract may not show up on the annual registers of two consecutive years. As the data frequency increases, so does the probability of observing such flows. Although this seems obvious, researchers in the past used rather ad-hoc shortcuts to infer quarterly data from annual sources. The most infamous one was the "divide by four" rule. Properly computed, each quarter, expanding Portuguese firms create, on average, 5 new jobs for every 100 existing jobs (and a similar number is destroyed). This process of expansion and contraction of employment in firms is achieved through the hiring and separation from 9 workers.[1] Excess worker turnover, at quarterly frequency, preserves the 2-to-1 rule observed in annual data.

The amount of job and worker flows has no normative interpretation. There is no sense of optimality – excessive or insuffcient – of the observed flows in the Portuguese labor market. Without a theoretical framework to determine the optimal level, comparing flows across labor markets is probably the best shortcut to the meaning of their magnitudes. The American labor market is often taken as a benchmark for its low level of regulation. Centeno and Novo (2012) compare the flow rates of Portugal with those for the U.S., even though the comparison may be hindered by different protocols used to collect the data, the level of coverage, and the sectoral composition of each country's employment.

Labor market flows in Portugal are smaller than in the U.S., both on annual and quarterly terms. On average, for the period considered, the annual flows in Portugal are 90% of those for the U.S. and the quarterly flows are about two-thirds. Note, however, how the hiring-to-job creation and separation-to-job destruction ratios are equal in both countries and in both data frequencies. This means that the cross-country differences in job flows are similar to the cross-country differences in worker flows. Albæk and Sorensen (1998) reports similar ratios for Denmark using annual data from 1980 to 1990 for the manufacturing sector and also Bassanini (2010) for a large number of OECD countries, using comparable datasets.

1 These quarterly rates are 50% higher than those obtained with the "divide by four" rule, which would yield around 3% for job creation and destruction and 6% for worker hirings and separations.

In this dimension, Portuguese and American firms are rather similar. A new net job in the U.S. is created by hiring two workers and firing one. The same rule holds in Portugal. But how can a labor market perceived as rigid have similar job creation formation rules? A large fraction of the adjustment – worker hirings and separations – is achieved through the excessive exposure of workers on flexible contractual arrangements.

Flows, match duration and type of contract

The high numbers of flows and excessive worker turnover do not mean that most workers rotate between jobs, as they are compatible with the prevalence of long-term employment (Hall 1982, Ureta 1992). However, this requires enough heterogeneity in hiring and separation rates across workers, which can be accomplished by placing the burden of the high turnover on fixed-term contracts.

In this subsection, we use *Quadros de Pessoal*, an annual administrative matched employer-employee dataset, where the information on the type of contract is available since 2002. *Quadros de Pessoal* have been extensively used in the microeconomic analysis of employment and firms in Portugal (Cabral and Mata 2003). On average, from 2002 to 2008, it reports information for 2.4 million salaried workers per year employed by 325 000 firms. Its coverage is similar to the Social Security dataset and the annual aggregate flows in the two datasets are about the same (Centeno, Machado and Novo 2008).

Table 4 presents the share of workers that preserve the 2002 match in the following years (from 2003 up to 2008), regardless of the initial number of years of tenure. The results show that there is a stable core of employment in Portuguese firms – around 40% of the workers are still employed by the same firm after six years (column 1). As expected, workers with a fixed-term contract in 2002 have a much smaller probability of remaining in the firm. In 2003, 40% were still on a fixed-term contract (column 2) and 14% had been converted to an open-ended contract (column 3). However, in 2008, only one quarter were still in the same firm, the majority with a permanent job, 19%, but 6% remained under a fixed-term contract.

These numbers hint at a great deal of turnover for fixed-term contracts. The heterogeneity in hiring and separation rates by type of contract is confirmed in Table 5. The share of fixed-term contracts is larger in firms increasing employment (28.9% of employment) than in firms decreasing employment (20.5% of employment). However, fixed-term contracts are the most important port-of-entry into these two types of firms; 54% of all accessions in expanding firms and 53% for firms reducing their employment level. Around 40% of all exits come from separation of workers under fixed-term contracts; this share is larger for expanding firms, around 47%, than for shrinking firms, where only 37% of all exits are from workers under fixed-term contracts.

Table 4

DURATION OF MATCHES BY CONTRACT TYPE

	Survival rates of 2002 matches	Fixed-term contract in 2002	
		Still fixed-term	Open-ended contract
	(1)	(2)	(3)
2003	70.3	41.4	14.1
2004	58.3	22.3	19.6
2005	53.2	13.8	22.9
2006	46.7	9.7	22.0
2007	42.1	7.5	20.4
2008	38.1	5.8	19.0

Source: *Quadros de Pessoal*, 2002-2008.

Notes: (1) Probability that an individual has the same employer in 2003,2004,…2008 as in 2002. (2) Probability that an individual who had a fixed-term contract in 2002 still has a fixed-term contract with the same firm in 2003, 2004, … 2008. Notethat, in 2003, fixed-term contracts could last up to 6 years. (3) Conversion rate, i.e., the probability that an individual who had a fixed-term contract in 2002 has an open-ended contract with the same firm in 2003, 2004, …, 2008.

Table 5

AVERAGE WORKER FLOWS BY CONTRACT TYPE | 2002-2008

	Firms with Net job creation (1)	Firms with Net job destruction (2)	Firms with Stable employment (3)
Hiring rate	37.2	12.3	13.4
into open-ended	17.1	5.8	8.0
into fixed-term	20.1	6.5	5.4
Separation rate	15.7	30.4	13.4
of open-ended	8.3	18.9	9.1
of fixed-term	7.4	11.5	4.3
Net growth rate	21.5	-18.1	0.0
Contribution by			
open-ended	8.8	-13.1	-1.1
fixed-term	12.7	-5.0	1.1
Employment			
open-ended	734.51	733,35	327,518
	71.1%	79.5%	83.5%
fixed-term	299.118	189.54	64.58
	28.9%	20.5%	16.5%

Source: *Quadros de Pessoal*, 2002-2008.

Table 5 also shows that expanding firms rely more on hirings under fixed-term contract to expand their operations. Of a net growth rate of 21.5%, 12.7 percentage points correspond to hirings on fixed-term contracts (60% of net employment gains). Conversely, contracting firms separate from a much larger share of permanent workers. Almost three quarters of the net employment losses of 18.1% result from a reduction in the level of permanent positions (13.1 percentage points).

4. Causal evidence: the 2004 employment protection reform

Hitherto, we presented a set of stylized facts characterizing the two-tier nature of the Portuguese labor market. This, however, has a limited scope. It does not allow to establish causal links flowing from the two-tier system to economic outcomes observed in the labor market. To overcome this limitation, Centeno and Novo (2012) take advantage of a legislative reform that took place in 2004 to gather causal evidence. The reform increased the degree of employment protection for open-ended contracts in a subset of firms, while other firms kept the pre-reform regime.

4.1. The 2004 reform: more protection for open-ended contracts

Fixed-term contracts were first introduced in 1976 and have been revised several times since. They are a legal instrument for all levels of qualifications and most tasks. Therefore, opting for an open-ended or a fixed-term contract does not hinge formally on job characteristics. Arguably, the main factors considered by firms are the costs involved with the termination of the two types of contracts. Firms distinguish between financial costs – the severance payment – and procedural costs – all the red-tape costs involved in processing the termination.

The financial costs are easy to measure as severance payments are pre-defined. During the first 36 months of tenure (the current maximum duration of fixed-term contracts), there are differences between the two contracts, but we argue that they are not significant. Workers on an open-ended contract are not entitled to severance payments during the trial period, the first 6 months of tenure (the exact number of months depends on the worker's qualification, varying between 3 and 8 months. Workers on open-ended contracts accumulate 2 days of severance payment for each month worked. For 7 to 29 months of tenure,

it is cheaper to separate from workers on fixed-term contracts than on open-ended. For instance, at 24 months the costs are 72 and 90 days of wages, respectively. From 30 to 36 months, it again becomes cheaper to separate from open-ended contracts. At 36 months of tenure, firing on fixed-term contracts costs 108 days of wages, while on open-ended cost 90 days.[2]

But the largest difference between the two contracts resides in the procedural costs to terminate a match. These are absent at the expiration of fixed-term contracts, but are rather significant for permanent positions. Firing a worker on an open-ended contract involves more than just paying a compensation. In Portugal, procedural costs are non-negligible. These include written procedures and witnesses interviews involving the workers council and, if the worker is a union delegate, the union itself. Altogether, the procedures extend the dismissal process substantially, typically 2 months, involves legal counselors and administrative costs.

Up to 2004, the law exempted firms with less than 20 workers from these legal procedures. A reform of the labor code in 2004 changed this threshold to 10 workers (*Decreto-Lei 99/2003*). Therefore, the reform generated a quasi-experiment in which the protection gap between open-ended and fixed-term contracts widened for a subset of firms, but remained the same for all other firms. In this setting, firms with 11 to 20 workers constitute the treatment group; and we define as control group firms with 21 to 100 workers, a subset of those not affected by the reform. The firm-size restrictions follow, among others, Burgess, Lane and Stevens (2001), Kugler and Pica (2008), and Martins (2009). We test extensively the sensitivity of our results to the specific choice of the treatment and control groups.

To study the impacts of this legislative reform, we resort to data taken from Quadros de Pessoal. Table A1, in the Appendix, presents summary statistics for the sample of treatment and control firms. There are a total of 45,876 firms, resulting in an unbalanced panel with 181,131 observations (year × firm pairs). These firms employed each year an average of 610,000 workers. In the before period, which corresponds to 2003, there were 14,170 treatment observations and 11,877 control observations. In the after period, 2004 to 2008, there were 81,439 treatment observations and 73,645 control observations. The average share of fixed-term contracts was 28.2%. Firms churned, on average, 24.6% of their workforce in annual terms. The churning of fixed-term workers was 34.7%, clearly larger than the churning of workers on open-ended contracts, 12.4%.

4.2. Match duration: Prima facie causal evidence

The parallel of the 2004 reform with clinical medical trial is illustrative. In medical trials, some individuals are randomly selected to take a medicine, while others are giv\en a placebo. In the 2004 reform, while there is no random selection, one set of firms faced new employment protection regulations, but the remaining firms kept the same regulations. Given that both groups shared the same economic environment and have similar characteristics, any differences in economic outcomes may be attributable to the differences in the regulation.

To get *prima facie* causal evidence of the impact of the 2004 two-tier reform on the structure of worker turnover, we resort to match duration statistics. Table 6 presents two-year match survival probabilities for treatment and control firms. We compute these probabilities in the pre-and post-reform periods, which have as base years 2002 and 2004, respectively.[3] This allows us to compare the two types of

2 At the expiration of a fixed-term contract, the worker receives a severance payment equal to 3 days for each month of employment (2 days if the employment relationship lasted less than 1 year). For permanent contracts the severance payment is set in court, typically at 30 days for each year of seniority, but the judge can set it between 15 and 45 days, with a minimum of 90 days. We base our computation on the 30 days rule.

3 Our data covers only one year in the pre-reform period, namely, 2003. This precludes us from computing survivals beyond two years. However, this shortcoming is mitigated by the fact that the conversion rates of fixed-term into open-ended contracts stabilize after the second year (Table 4).

Table 6

DURATION OF MATCHES | UNCONDITIONAL DIFFERENCE-IN-DIFFERENCES

	Two-year survival probability		Two-year probability that a fixed-term is still fixed-term		Two-year probability that a fixed-term is converted to open-ended	
	Before (1)	After (1')	Before (2)	After (2')	Before (3)	After (3')
Treatment (T)	54.6	59.4	22.0	28.9	18.0	15.8
Control (C)	58.9	63.1	24.8	29.2	19.4	19.0
Differences (T - C)	-4.3	-3.7	-2.9	-0.4	-1.3	-3.2
Difference-in-differences	0.7		2.5		-1.9	
	(0.164)		(0.301)		(0.263)	

Source: *Quadros de Pessoal*, 2002, 2004, 2006.

Notes: The before period considers 2002 matches; the after period considers 2004 matches. Treatment firms have 11 to 20 workers and control firms 21 to 100 workers In columns (1) and (1'), we compute the probability that a match survives two years. The last 4 columns repeat the exercise only for fixed-term matches. In columns (2) and (2'), we compute the two-year survival probability of a fixed-term contract. In columns (3) and (3'), we compute the two-year conversion rate of fixed-term contracts into open-ended contracts. Standard errors in parentheses.

firms over the two time periods. Before the reform, the two-year survival rates among treated firms was 4.3 percentage points lower than among the control firms. After increasing the degree of protection of open-ended contracts for treated firms, the gap between the two groups decreased to 3.7 percentage points. Thus, under the assumption of a common reaction to aggregate shocks, we conclude that the legislation – the only distinct factor – caused an increase of 0.7 percentage points (–3.7 – (–4.3)) in the two-year probability that a match survives. But did this effect spread evenly through all workers?

The answer is a clear no. Lets look only at workers on fixed-term contracts and see how firms responded when faced with higher procedural firing costs of open-ended contracts. Due to the new legislation, treated firms increased the share of workers still on a fixed-term contract by 2.5 percentage points (column (2)-(2')). More importantly from the point of view of worker turnover, treated firms also reduced the conversion rate of fixed-term into open-ended contracts by 1.9 percentage points (column (3)-(3')). Others have argued that, in Portugal, fixed-term contracts are used, *inter alia*, as screening devices, but this claim does not stand the causal evidence of a reduction in the conversion rate. On the contrary, the causal evidence supports the theoretical argument and also the empirical of Cahuc *et al*. (2012). From the point of view of the legislator, it is important to note that our results constitute causal evidence that changing the regulations for open-ended contracts affects also the outcomes of workers on fixed-term contracts.

4.3. Excess worker turnover: Causal evidence

A distinctive feature of two-tier labor markets is the uneven spread of the burden of adjustment among workers. To obtain causal evidence in support of this claim, we explore further the 2004 quasi-experiment.

In general terms, we employ the methodology used above, designated by difference-indifferences. However, the claim that firms in the treatment and control groups have similar observable characteristics may be far-fetched, after all there was no random assignment to treatment. To overcome this shortcoming, each of the differences is estimated after controlling for several dimensions that could explain observable differences in economic outcomes of the two groups. In this exercise, the remaining differences between treated and control firms are not attributable to differences in average firm wages, percentage of blue-collar workers, educational composition of the workforce, firm size, firm age, workforce average age, workforce average tenure, and to periods of employment growth or contraction.[4]

4 Technically, the estimation method goes a step further and controls also for unobserved heterogeneity that does not vary overtime within each firm (firm fixed effects). For the full details on the estimation method and additional results see Centeno and Novo (2012).

As we have argued that the rotation of workers is a natural process and it involves simultaneous hirings and separations, which are more costly for workers with open-ended contracts. Thus, firms that faced an increase in the firing costs of open-ended contracts may have opted for increasing the share of fixed-term contracts. We test this hypothesis in the quasi-experimental setting. Column (1) of Table 7 reports the average treatment effect on the share of fixed-term contracts for the treated firms. We conclude that the new legislation caused treated firms to increase their usage of fixed-term contracts by 1.6 percentage points.

The increase in the share of fixed-term contracts is the first unintended consequence of aggravating the difference in protection between these flexible contracts and open-ended contracts. Unfortunately, the collateral damage does not stop here. In columns (2) and (3), we test how the new legislation affected the rate of excess worker turnover by type of contract. Again, we observe an increase of excess worker turnover among workers on fixed-term contracts in treated firms. The rate of excess worker turnover of fixed-term contracts, which is about 3 times larger than for open-ended contracts (34.7% vs. 12.4%), increases 1.3 percentage points among treated firms. But even the turnover of open-ended contracts registers only a slight and non-significant reduction, -0.1 percentage points. These results are aligned with the models' predictions. They corroborate the shift towards an extended usage of fixed-term contracts and that there is a strong substitution between the two type of workers. This strong substitutability may not be surprising because the contract type is a non-productive characteristics of the match. This evidence for Portugal is in line with the results found in Cappellari, Dell'Aringa and Leonardi (2011) for Italian firms.

Finally, in column (4), we report the results of the difference-in-differences estimation for total excess worker turnover. The estimate indicates that the more stringent dismissals regulation did not change the level of excess worker turnover for treated firms. Although Martins (2009) did not study excess turnover, he also did not find any impact on total job and worker flows of a reduction occured in 1989, in employment protection, for Portuguese firms.

Table 7

CASUAL EVIDENCE | CONDITIONAL DIFFERENCE-IN-DIFFERENCES

	Share of fixed-term	Excess worker turnover of fixed-term	Excess worker turnover of open-ended	Excess worker turnover Total
	(1)	(2)	(3)	(4)
Difference-in-differences	1.63	1.31	-0.11	0.29
	(0.182)	(0.649)	(0250)	(0.277)
Control variables			- Yes. See notes -	
Average of dependent variable (in %)	28.2	34.7	12.4	24.6
Number of firms	45 876	34 049	43 708	45 876
Number of observations	181 131	107 768	171 255	181 131

Sources: *Ministério da Solidariedade e Segurança Social* (*Quadros de Pessoal*, 2002-2008) and author's calculations.

Notes: Difference-in-difference expressed in percentage points. Standard errors in paren¬theses from firm fixed effects estimates. The "before" periods corresponds to 2003 and the "after" period to 2004-2008. Each period, a treatment firm has 11 to 20 workers and a control firm has 21 to 100 workers.

5. Dismantling the two-tier system

Our analysis of labor market flows in the Portuguese economy shows that to fill a vacancy firms hire and separate from more than one worker. This is a stylized fact, common across labor markets. The personnel policies of Portuguese firms, however conditioned by the perceived rigid labor code, are conducive to an intense reallocation of workers. In this essay, we studied in great detail the connection of this turnover with labor market segmentation.

In the context of two-tier systems, fixed-term contracts are a crucial instrument of adjustment in the matching process. The continuous increase in the share of fixed-term contracts in the Portuguese economy reflects the need of flexible labor arrangements in a world economy where product and labor markets are ever more integrated. These systems generate strong volatility in employment and unemployment. Alas, these fluctuation penalize in excess the employment and wages of specific workers. A segmentation that is quite detrimental to the effciency of the labor market and, therefore, of the overall economy.

Moving forward requires dismantling the more extreme characteristics of the Portuguese two-tier system. A successful approach must be based on the definition of a set of coherent policies, with a broad scope both in terms of workers affected and policy areas covered. In general terms, labor regulations need to be designed to facilitate the adjustment of employment to the firms economic conditions, while protecting workers from unexpected fluctuations in income during periods of temporary non-employment. Essentially, this requires revising unemployment insurance, active labor market policies and employment protection legislation. But in no instance should labor market policies be used to achieve social goals; for instance, increasing the minimum wage to reduce poverty may benefit some workers at the cost of less employment. The minimum wage policy should curb the monopsonic power of firms, but otherwise social policies should be used to address poverty issues.

The unemployment insurance system is intended to facilitate and protect the transitions between jobs by smoothing consumption in jobless periods. But, as with other insurance systems, a balance must be stricken between the protection that it provides and the riskier behavior that induces. On the one hand, unemployment insurance generates an income effect that allows unemployed workers to search not only for a job, but for the right one, resulting in better post-unemployment matches (Gruber (1997), Centeno (2004), Chetty (2008) and Centeno and Novo (2009)). On the other hand, it decreases the price of leisure time, inducing a substitution effect of leisure for work. Furthermore, an unemployment system where the firm contributory rate is not dependent on its rate of layoffs may entail loose worker turnover policies because workers are protected and firms do not have to pay higher insurance premiums.

In Portugal, after several revisions, the unemployment insurance is still incorrectly regarded as a subsidy. Not strange to a social interpretation of labor market policies, the duration of the entitlement period is primarily a function of the worker age, rather than a function of labor market participation (contributions). Over and again, research has shown that an unemployment insurance system to cope with segmentation will need to be universal, with low barriers to entry; with entitlement periods defined with a simple participation-based mechanism; with short entitlement periods, which vary with the business cycle (increase when the unemployment rate exceeds a given threshold); with a generous replacement rate of previous wages; with effective search effort monitoring mechanisms and associated penalization of abuses; and with firms' contributory rates based on the usage of the system by former workers.

A second set of instruments, active labor market polices, absorbs a substantial fraction of resources of the economy in developed economies. It is not rare to devote more than 1% of GDP to job search assistance and training programs. Although, these policies aim at activating unemployed workers, the evaluations of such programs are often disappointing (Centeno, Centeno and Novo 2009, Kluve 2010). It is suggested that a more effcient allocation of resources would require targeting very specific groups – those with meager labor market prospects, typically long-term unemployed and, among them, the low-qualified workers. The European experience also shows that providing job search assistance with

a combination of counselling, monitoring and sanctions for non-compliance is more effective and less costly and integrates well with unemployment insurance policies.

In view of the prevailing dismal evaluations, two additional notes of caution are granted. First, public schemes crowd out private effort. The initial threat effect of participation seems to activate workers, but the effect dies out quickly, advising against long programs. Second, policies that encompass wage subsidies tend to have better assessments (Katz 1998). However, these policies may misalign the firms' incentives and cause sharp discontinuities when the subsidy finishes, prompting firms to replace non-subsidized workers by other workers that are entitled to the subsidy.

This essay tested the predictions of two-tier models in a quasi-experimental setting. We showed that a more stringent protection of workers on open-ended contracts caused an increase in the reliance on fixed-term contracts by treated firms to achieve their desired level of worker turnover. In this context, we also showed that the same reform caused an increase in churning among workers on fixed-term contracts. Both results pointed to the substitutability of workers on the two type of contracts and the increased burden of adjustment placed on the more flexible contracts. However, given that the contract should not be made a productive device of the job match definition, these conclusions are strongly supportive of a reduction in the number of contract types in the economy.

The reduction of the number of contracts could be implemented by retaining the structure of the rules governing permanent contracts, adjusting appropriately the main components, namely, severance payments, advance notice, trial period, and non-economic reasons for dismissal.

The regulation needs to address the fact that it is optimal to protect the worker against involuntary job losses forseeing the payment of a severance in cases of lay-offs. Workers are the most liquidity constrained part in the employment relationship and face a human capital loss with the separation. By paying a severance payment, the firm also internalizes the social costs that it imposes on society. However, it is no less important to guarantee that firms have enough leeway to manage their operations over the business cycle and in structural adjustments. They should have the capacity to take decisions that are consistent with the optimization of its economic results. These two potentially antagonic objectives require balancing more generous severance payments with longer trial periods, longer advance notice periods and reasonable non-economic reasons for dismissals.

The current difference in procedural firing costs between fixed-term and open-ended contracts is the highest barrier to effcient labor allocations. There should be a massive reduction of these costs. They fall on both parts of the employment relationship. These procedures are lengthy and costly (both administratively and judicially). The current state promotes negotiations on the side of the legal system with the aim of circumventing the costs of the formal procedures. Evidence of this behavior is the small share of layoff processes that reach the courts and the agreed-upon severance payments above the maximum labor code level.

When faced with a job loss, the worker needs time to find a suitable job. This task will be more successful – result in better wages and longer tenure – if the new job is found in the first months of unemployment. An increase in the advance notice period will generate more secure and successful job-to-job transitions.

Firms use the first months of an employment relationship to screen workers; matches are indeed experience goods. A long trial period is a key ingredient to form effcient worker and firm matches. But not too long or it would play the ineffcient role currently played by fixed-term contracts.

The legal system is crucial to protect property rights of both workers and firms. The current unbalanced access to the judicial system only reinforces segmentation. Arbitration should be reduced to fair dismissals and to non-economic reasons cases. This will limit the judicial system second guessing of economic outcomes. The legislation should protect workers against discrimination, but stay short of interfering in purely economic decisions by firms. In this context, temporary contracts would be abolished, except in

well-defined situations (*e.g.* replace a worker on maternity leave).

We are aware that implementing this set of coherent reforms requires a huge political economy effort. To alleviate it, at some cost, the new rules do not have to apply to existent contracts. This would preserve a legacy market that through the simple function of the labor market would quickly become residual. Under the current system, only 40% of the matches that existed in 2002 survived until 2008 and 75% of workers have jobs with less than 10 years of tenure. The fear that the new policies would trigger match destruction are not justified. Countries like Austria introduced significant reforms to employment protection without prompting higher levels job and worker flows. The balance across the different policy instruments prevents it.

The political economy debate on the reduction of the employment protection gap, through the creation of a single contract, is discussed in Blanchard and Tirole (2008). After all, as motivated by several search models, the stochastic nature of the matching process leads necessarily to a desirable trial process. This essay pointed out the virtues of a contractual setting that would spread more uniformly the adjustment costs across all workers, without hindering the formation of long-term productive employment relationships. It is important to stress that this setting will reduce uncertainty for firms and workers and will frame their behavior on incentive compatible market-based mechanisms.

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A. Appendix

A.1. Concepts: aggregate job and worker flows

Our analysis of job and worker flows is based on the standard definitions laid down in Davis, Haltiwanger and Schuh (1996). For a given firm, the year-to-year job creation and destruction rates are, respectively,

$$C_t = \max\left\{0, \frac{X_t - X_{t-1}}{\left(X_t - X_{t-1}\right)/2}\right\} \quad \text{and} \quad C_t = \max\left\{0, \frac{X_{t-1} - X_t}{\left(X_t - X_{t-1}\right)/2}\right\},$$

where X_t is the number of employees in (October of) year t.

The hirings in year t, Ht, are defined as the number of workers in a firm at time t that were not employed in that firm at t-1. The separations in year t, S_t, are equal to the number of workers in a firm at time t-1 that are not employed in that firm at t. The year-to-year rates are

$$HR_t = \left\{\frac{H_t}{\left(X_t + X_{t-1}\right)/2}\right\} \quad \text{and} \quad SR_t = \left\{\frac{S_t}{\left(X_t + X_{t-1}\right)/2}\right\}.$$

The rate of net employment change (NEC) is equal to the difference between the hiring and separation rates, NEC_t=HR_t-SR_t. The rate of excess worker turnover is given by EWT_t= HR_t+SRt-|NEC_t|, and corresponds to worker flows in excess of those strictly necessary to achieve a given level of employment. In the literature this concept is also known as churning (Burgess, Lane and Stevens 2000).

A.2. Concepts: job and worker flows by type of contract

We apply these conventional definitions to the groups of workers defined by contract type. We considered as separations from open-ended contracts all workers who had an open-ended contract in t-1, but are no longer with the firm in year t; similarly, hirings are defined as all workers with an open-ended contract in t who were not in the firm in year t-1. The rate of excess worker turnover for open-ended contracts is obtained by dividing these flows by the average number of open-ended contracts in the firm in the two periods.

The same computation is made with respect to fixed-term contracts. One note must be made, however, since some fixed-term contracts may be converted into open-ended contracts. We do not consider these conversions neither as separations from fixed-term contracts, nor as hirings into open-ended contracts. Thus, hirings and separations imply always a flow in or out of the firm, respectively.

Note that total excess worker turnover is not equal to the sum of excess worker turnover by contract type. A simple example makes this point clear. Consider a firm with 50 workers that decides to replace 10 open-ended jobs with 10 workers under fixed-term contracts. This will generate excess worker turnover because the firm engages in hirings and separations simultaneously. In particular, it results in an excess turnover rate of 0.4.

However, for each type of contract the turnover is zero. This results from the fact that the increase in level of fixed-term contracts equals the number of hirings and the reduction in open-ended contracts equals the number of separations.

Table A1

SUMMARY STATISTICS: FIRM-LEVEL DATA, 2003-2008

Variable (firm level)	Mean	Std. Deviation
Fixed-term (in %)	28.2	27.93
Total excess worker turnover (in %)	24.6	25.71
Excess worker turnover by contract type:		
Fixed-term contract	34.7	39.89
Open-ended contract	12.4	19.75
(Log) base wage	6.39	0.38
Blue-collor workers (in %)	36.3	25.19
Educational level, percentage of workers with:		
9 or less years	69.9	27.31
10-12 years	19.7	18.97
College	10.4	16.56
Females (in %)	42.7	32.67
Immigrants (in %)	5.6	13.23
Firm size (average number of workers)	27.1	18.86
Firm age (in years)	21.2	24.47
Workforce average age (in years)	37.7	5.28
Workforce average tenure (in months)	79.8	57.08
Worker-firm matches (2003-2008)	4 903 529	
Number of firms	45 876	
Number of observations (firm x year)		
Before the reform		
Treatment	14 170	
Control	11 877	
After the reform		
Treatment	81 439	
Control	73 645	
Total	181 131	

Sources: *Ministério da Solidariedade e Segurança Social* (*Quadros de Pessoal*, 2002-2008) and author's calculations.

Notes: *Quadros de Pessoal*, firm-level values 2003-2008. The "Before" period corresponds to 2003 and the "After" period to 2004-2008. Each period, a treatment firm has 11 a 20 workers and a control firm has 21 to 100 workers.

ECONOMIC AND POLICY DEVELOPMENTS

II

PROJECTIONS FOR THE PORTUGUESE ECONOMY: 2012-2013

PROJECTIONS FOR THE PORTUGUESE ECONOMY: 2012-2013

The developments of the Portuguese economy in 2011 were decisively marked by the interruption of access to market financing and by the start of the implementation of the Economic and Financial Assistance Programme (EFAP), which is also the main reference for the medium-term outlook analysis.

The EFAP provides a stable financing framework for the 2011-2014 period and a strategy for both the adjustment of macroeconomic imbalances in the Portuguese economy and the increase in its growth potential, based on three pillars: lasting fiscal consolidation, financial system stability and structural transformation of the Portuguese economy. These pillars are fundamental to prevent the abrupt and disorderly adjustment that would occur in the absence of financing, and to create sustainable growth conditions in the Portuguese economy and convergence with average per capita income levels in the euro area.

In 2011, this adjustment process of accumulated imbalances in the Portuguese economy translated into a 1.6 per cent decline in Gross Domestic Product (GDP). GDP developments reflect a contraction in all domestic demand components, partly offset by robust growth in exports of goods and services. The current projections for 2012-2013 suggest a continuation of this process, with a contraction of economic activity of 3.4 per cent in 2012, followed by stagnation in 2013 (Table 1). Domestic demand is projected to continue to decline in the current year, reflecting in particular a more pronounced downturn in private consumption, in a context of strong deterioration of households' disposable income. In turn, the contribution of exports will continue to be important to sustain activity, in spite of the projected significant slowdown *vis-à-vis* robust growth in 2011, as a result of a marked deterioration of external demand prospects. Balance-sheet adjustments in the public and private sectors have translated into declining external imbalances, reflected in a significant improvement in the current and capital account balance in 2011, which is projected to continue into forthcoming years.

Table 1

PROJECTIONS OF BANCO DE PORTUGAL: 2012-2013 | ANNUAL RATE OF CHANGE, PER CENT

	Weights 2011	EB Spring 2012			EB Winter 2011		
		2011	2012(p)	2013(p)	2011(p)	2012(p)	2013(p)
Gross Domestic Product	100.0	-1.6	-3.4	0.0	-1.6	-3.1	0.3
Private consumption	66.3	-3.9	-7.3	-1.9	-3.6	-6.0	-1.8
Public consumption	20.2	-3.9	-1.7	-1.2	-3.2	-2.9	-1.4
Gross Fixed Capital Formation	18.0	-11.4	-12.0	-1.7	-11.2	-12.8	-1.8
Domestic demand	103.9	-5.7	-6.2	-1.6	-5.2	-6.6	-1.6
Exports	35.5	7.4	2.7	4.4	7.3	4.1	5.8
Imports	39.3	-5.5	-5.6	0.0	-4.3	-6.3	0.7
Contribution to GDP growth (in p.p.)							
Net exports		4.6	3.1	1.6	4.1	3.9	1.9
Domestic demand		-6.2	-6.5	-1.7	-5.6	-6.7	-1.5
of which: change in inventories		-0.5	0.8	0.1	-0.3	0.1	0.2
Current plus capital account (% of GDP)		-5.2	-2.8	-0.4	-6.8	-1.6	0.8
Trade Balance (% of GDP)		-3.2	-1.0	1.0	-3.7	0.3	2.4
Harmonised Index of Consumer Prices		3.6	3.2	0.9	3.6	3.2	1.0

Sources: *INE* and Banco de Portugal.

Notes: (p) - projected. For each aggregate, this table shows the projection corresponding to the most likely value, conditional on the set of assumptions considered, and based on information available up to early March 2012.

Slowdown of external demand in 2012, and maintenance of money-market short-term interest rates at low levels

Underlying the current projections is a range of assumptions regarding the Portuguese economy's external context, developments in public finances, and the domestic financing conditions of the economy (Table 2).

As regards international trade developments, the current assumptions reflect recent information published by the European Central Bank in the March 2012 issue of its Monthly Bulletin. This suggests a slowdown in overall activity growth in 2012. In particular, growth prospects in advanced economies, including the euro area, will probably remain subdued due to persisting tensions associated with the sovereign debt crisis, as well as by the impact of fiscal consolidation measures and the deleveraging process in the private sector. In this context, external demand for Portuguese goods and services is expected to slow down temporarily in 2012. In 2013 it is expected to show a pace of growth similar to that recorded in 2011. These assumptions imply a downward revision of external demand growth from the one published in the previous Economic Bulletin.

The exchange rate assumptions, which imply that they remain constant at the average levels observed in the two weeks prior to the cut-off date, entail a nominal depreciation of the euro in 2012, both in effective terms and *vis-à-vis* the US dollar. These assumptions imply an unchanged EUR-USD exchange rate profile when compared to the winter issue of the Economic Bulletin.[1]

As regards the oil price in US dollars, the information implied in futures markets points to a temporary rise in 2012, whereas in 2013 it is expected to stand close to the level recorded in 2011. This profile contrasts with the downward trend in the oil price underlying the previous Economic Bulletin and is associated with intensifying geopolitical tensions.

As regards financing conditions, the technical assumption for the short-term interest rate (3-month EURIBOR rate) implied in futures contracts implies its stability over the projection horizon at levels slightly below 1 per cent, comprising a downward revision from the winter issue of the Economic Bulletin. As regards domestic financing conditions, these have been increasingly tighter, translating, inter alia, into an increasing spread between lending interest rates and money-market reference rates.[2] The projection

Table 2

PROJECTION ASSUMPTIONS

		EB Spring 2012			EB Winter 2011		
		2011	2012	2013	2011	2012	2013
External demand	yoy	3.9	0.6	4.4	4.7	3.2	5.7
Interest rate							
Short-term (3-month EURIBOR)	%	1.4	0.8	0.8	1.4	1.1	1.1
Long-term[(a)]	%	4.1	2.2	2.2	4.9	3.3	3.7
EUR exchange rate							
EUR effective exchange rate	yoy	-0.2	-3.3	0.1	-0.1	-1.2	0.0
EUR-USD	aav	1.39	1.33	1.33	1.39	1.33	1.33
Oil price							
in USD	aav	111.0	119.6	113.8	111.1	106.7	102.4
in EUR	aav	79.7	90.2	85.6	79.7	80.2	77.0

Sources: Bloomberg, ECB, Thomson Reuters and Banco de Portugal's calculations.

Notes: yoy - year-on-year rate of change, % - per cent, aav - annual average value. An increase in the exchange rate represents an appreciation. **(a)** The annual average value for 2011 corresponds in the first quarter to a market interest rate and in the remaining quarters of that year, as well as over the projection horizon, to an estimate of the interest rate of the EU/IMF Financial Assistance Programme.

1 The assumptions for the nominal effective exchange rate of the euro cannot be directly compared with those in the winter issue of the Economic Bulletin, given that this series was revised following an update of the international trade weights underlying its calculation. For further information, see the ECB's methodological note in this update: http://www.ecb.europa.eu/stats/pdf/exchange/Methodological_note_MoBu_Jan2012.pdf.

2 For further information, see the Bank Lending Survey – Results for Portugal: January 2012.

exercise assumes that the increasing trend of these spreads will continue into early 2013, to be followed by a moderate narrowing up to the end of the projection horizon, although to levels well above those prevailing before the financial crisis.

The assumptions for the long-term sovereign debt interest rate, as of the second quarter of 2011, reflect an estimate of the average external financing rate under the EFAP, implying its reduction in 2012 and stabilisation in 2013.[3] The updated international financing costs of financing institutions imply a downward revision of these assumptions *vis-à-vis* the previous Economic Bulletin.

The assumptions for public finance developments are based on the rule adopted in Eurosystem exercises, which only considers the measures already approved by national parliaments or that have been specified in sufficient detail by governments and are likely to pass the legislative process. Therefore, the present projections include, in particular, the measures underlying the State Budget for 2012. According to these assumptions, the volume of public consumption is projected to contract further over the projection horizon, albeit at a more moderate pace than in 2011. The fall in nominal public consumption is expected to be more significant, reflecting the behaviour of the respective deflator. Worthy of mention in this respect is the suspension of the holiday and Christmas bonuses for civil servants in 2012. This will have a differentiated and gradual nature.

Decline of 1.6 per cent in economic activity in 2011

GDP decreased by 1.6 per cent in 2011, as a result of a contraction in all domestic demand components. In particular, private consumption and Gross Fixed Capital Formation (GFCF) have further intensified their declining trend over the course of the year, in year-on-year terms. The impact of domestic demand developments on GDP was partly offset by continued robust growth of exports of goods and services. Compared with the one projected in the previous Economic Bulletin, GDP growth in 2011 remained unchanged, in spite of a downward revision in all domestic demand components, which was offset by an also downward revision in imports of goods and services. These revisions largely reflect more unfavourable developments than projected for domestic demand in the fourth quarter of 2011. In this context, it is also worth mentioning the deterioration of labour market conditions in 2011, particularly in the fourth quarter, which translated into a fall in employment identical to that observed in the previous year and into a very significant rise in the unemployment rate.

As regards corporate financing conditions, the available evidence suggests that there have been no abrupt aggregate quantitative restrictions on the supply side. There are, however, large differences among corporations and among sectors. Indeed, in a context of strong domestic demand contraction, credit risk has tended to exacerbate in some non-tradable goods sectors corporations, as well as in smaller corporations. In turn, in contrast to the sovereign and banking situation, a range of corporations with better financial situation and with external links managed to increase their recourse to external financing at the end of the year. In 2011, total financing by non-residents to private corporations ascended to about €4,300 million. This explains why total credit[4] to private corporations has risen by 0.4 per cent at the end of 2011, whereas domestic bank loans[5] fell by 2.4 per cent.

It is crucial that the banking system continues to help the most dynamic and productive corporations overcome possible temporary liquidity problems and/or restructure their operations, thereby contributing to the necessary restructuring of Portuguese economy.

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3 For further information on the EFAP, see http://www.bportugal.pt/en-US/OBancoeoEurosistema/ProgramaApoioEconomicoFinanceiro/Pages/default.aspx.

4 Including domestic and external credit under the form of loans, debt securities and trade credit.

5 Adjusted for the effect of credit sales by the largest Portuguese banks, as well as other operations with no actual impact on corporate financing.

Significant decline in GDP in 2012 and stagnation in 2013

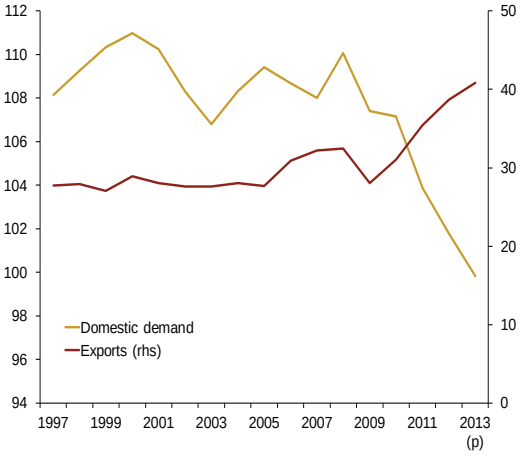
Current projections point to a significant contraction in economic activity in 2012 (3.4 per cent, compared with 1.6 per cent in 2011), followed by stagnation in 2013. These projections reflect a continued sharp fall in domestic demand (around 14 per cent in cumulative terms in the 2011-2013 period). Exports are expected to maintain a role in mitigating the impact of contracting domestic demand, in spite of a slowdown in 2012-2013, against a background of moderating global economic activity. This framework implies a recomposition of expenditure, characterised by a significant decline in the weight of domestic demand in GDP, in tandem with an increase in the weight of exports (Chart 1).

After having contracted by 3.9 per cent in 2011, private consumption is projected to decrease by 7.3 per cent in 2012 and by 1.9 per cent in 2013. This profile largely reflects developments projected for disposable income, in a context where tighter financing conditions limit the capacity of many consumers to smooth fluctuations in consumption levels. Disposable income will probably be significantly restricted over the projection horizon by the impact of fiscal consolidation measures, as well as by a reduction in labour income, in a context of sharp deterioration of labour market conditions. The current projections point to an increase in the savings rate over the projection horizon (Chart 2). In effect, in addition to the maintenance of high mandatory savings levels associated with credit amortization, lower permanent income prospects may lead to a revaluation of consumption decisions by consumers that do not face liquidity constraints, favouring an increase in precautionary savings.

GFCF is projected to decline in 2012 by slightly more than in the previous year (12 per cent, compared with 11.4 per cent in 2011), in line with the profile projected for the business component, which will reflect the continued deterioration of demand prospects of corporations. Over the course of 2013, business GFCF is expected to exhibit a recovery trend, benefiting from the acceleration projected for external demand. Total GFCF, however, is still expected to decline in annual average terms in 2013 (1.7 per cent). In addition, developments projected for disposable income, as well as for financing conditions, are expected to condition residential GFCF developments over the projection horizon. Within the framework of the fiscal consolidation process, public GFCF is projected to decrease very significantly in 2012-2013, similarly to 2011. Changes in inventories are projected to contribute around 0.8 percentage points (p.p.) to GDP growth in 2012, since the very significant destocking recorded in 2011, particularly in the fourth

Chart 1

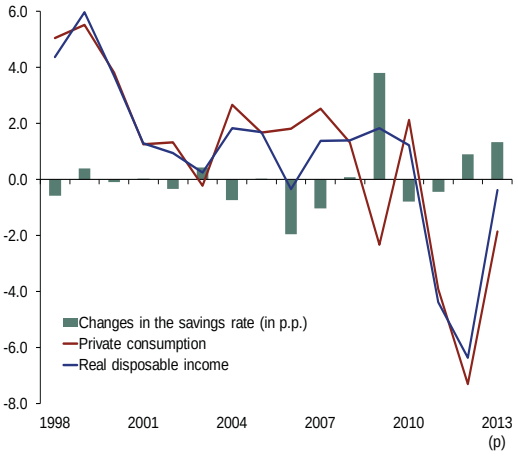
WEIGHT OF DOMESTIC DEMAND AND EXPORTS IN GDP | AS A PERCENTAGE OF NOMINAL GDP



Sources: *INE* and Banco de Portugal.
Note: (p) – projected.

Chart 2

CONSUMPTION, DISPOSABLE INCOME AND SAVINGS RATE | ANNUAL AVERAGE RATE OF CHANGE



Sources: *INE* and Banco de Portugal.
Notes: (p) – projected. The savings rate is represented as a percentage of disposable income.

quarter, is considered to be of a temporary nature. In 2013, the contribution of this component to GDP growth is projected to be virtually nil.

After having grown by 7.4 per cent in 2011, exports are projected to slow down to 2.7 per cent in 2012 and to accelerate to 4.4 per cent in 2013. Underlying these developments, which are common to the goods and services components, is an increase in market share in 2012 (Chart 3). The behaviour of exports reflects the redirection of tradable goods producers to external markets, wider geographical diversification, implying a rise in the weight of extra-EU markets, which are projected to remain buoyant over the projection horizon, and an improvement in relative costs. As previously mentioned, the assumptions for external demand imply a downward revision from the previous Economic Bulletin, a trend that has persisted since the autumn of 2011 (Chart 4). The gradual deterioration of prospects for global economic growth reflects *inter alia* tensions associated with the sovereign debt crisis in the euro area, in tandem with high uncertainty as to the mechanisms for its resolution, in a context of increasingly close interaction between the financial system and real economy. This highly volatile context implies that, although the deceleration of external demand is assumed to be temporary, its developments may fundamentally influence the recovery path of the Portuguese economy, given that demand prospects in the domestic market are highly constrained by the need for continued adjustment of macroeconomic imbalances.

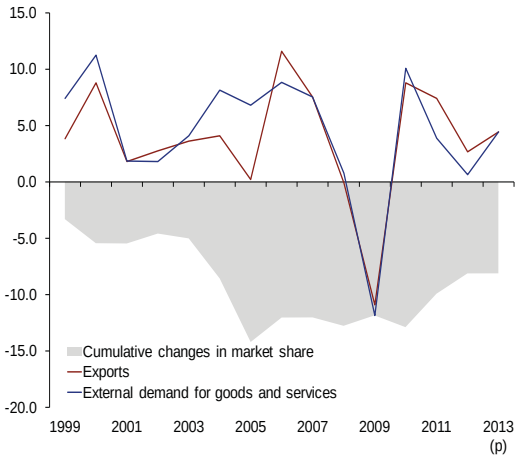
Imports are projected to decline by 5.6 per cent in 2012, a similar contraction to the one recorded in 2011. This component is projected to stabilise in 2013, reflecting the buoyant recovery of some relatively high import-content expenditure components, such as exports and business GFCF. These developments imply a reduction in the import content of final demand in 2011-2013, as observed in previous recessions.

When compared with the previous Economic Bulletin, current projections point to a downward revision of GDP growth by 0.3 p.p. in 2012 and 2013, partly reflecting the revision of exports due to less favourable assumptions for external demand developments, as well as the impact on income prospects and, as a result, on private consumption, of a more marked deterioration of labour market conditions, particularly in 2012.

The financing requirements of the Portuguese economy are projected to decline substantially over the projection horizon, from -5.2 per cent of GDP in 2011 to -0.4 per cent of GDP in 2013. This adjustment trend is similar to that observed in the context of the economic stabilisation agreements concluded with

Chart 3

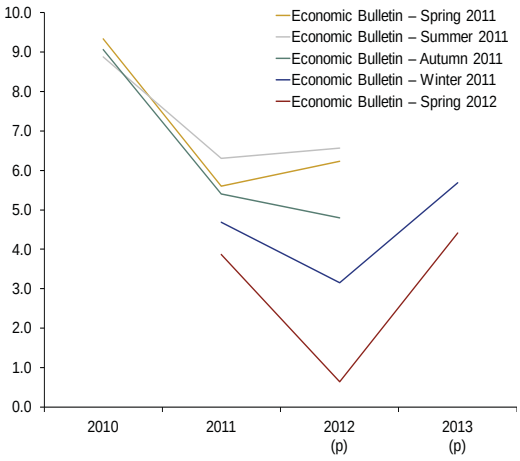
EXPORTS, EXTERNAL DEMAND AND MARKET SHARE | ANNUAL RATE OF CHANGE



Sources: ECB, *INE* and Banco de Portugal.
Note: (p) – projected.

Chart 4

DEVELOPMENTS IN EXTERNAL DEMAND | ANNUAL RATE OF CHANGE



Sources: ECB, IMF and Banco de Portugal´s calculations.
Note: (p) – projected.

the International Monetary Fund (IMF) in the 1970s and 1980s (Chart 5). Underlying these developments is a significant improvement in the trade balance, which is projected to increase from -3.2 per cent of GDP in 2011 to -1.0 per cent of GDP in 2012 and 1.0 per cent of GDP in 2013 (Chart 6). This is largely the result of a volume effect, which offsets a terms-of-trade unfavourable effect in 2012, partly driven by energy. A slight terms-of-trade improvement is projected for 2013. The income account deficit as a percentage of GDP is projected to decline moderately over the projection horizon, reflecting more favourable assumptions for interest rates.

As regards the labour market, employment is projected to decline by 3.6 per cent in 2012 and by 0.7 per cent in 2013 (compared with a 1.5 per cent decrease in 2011). The significant contraction in employment projected for 2012 is expected to be more marked in the private sector, reflecting economic activity developments, as well as carry-over effects resulting from rather adverse dynamics in the fourth quarter of 2011. Employment in the public sector is projected to maintain a relatively constant pace of reduction over the projection horizon, with a sharper fall than in the private sector in 2013.

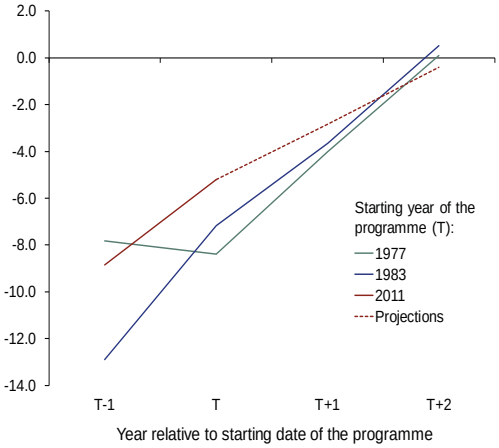
Particularly relevant in the current context is the implementation of structural reforms to increase growth of the Portuguese economy, as envisaged in the EFAP. These include measures to favour competitiveness, especially by promoting competition in some sectors that have so far been protected, and changing the labour market's institutional framework, characterised by marked segmentation (see 'Segmentation', the Issue for Discussion in this Bulletin). In addition, the Programme also includes reforms to boost the institutional framework of the economy, with emphasis on the reform of the judicial system. These measures are deemed essential to promote benefits for the Portuguese economy arising from the correction of current macroeconomic imbalances.

Inflation to remain close to 3 per cent in 2012 and to decrease to around 1 per cent in 2013, with the fading out of fiscal factors

HICP (Harmonised Index of Consumer Prices) inflation is projected to remain relatively stable in 2012 (annual average rate of change of 3.2 per cent, compared with 3.6 per cent in 2011), and to fall to 0.9

Chart 5

DEVELOPMENTS IN FINANCING REQUIREMENTS DURING INTERNATIONAL FINANCIAL ASSISTANCE PROGRAMMES | AS A PERCENTAGE OF GDP

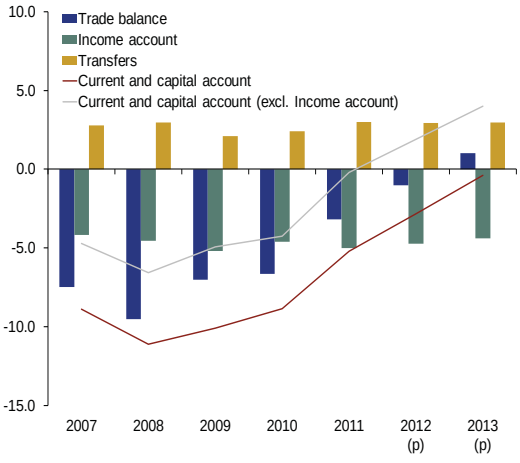


Sources: *INE* and Banco de Portugal.

Note: As regards the 1977 and 1983 programmes, data refer to the Current Account.

Chart 6

DEVELOPMENTS IN FINANCING REQUIREMENTS | AS A PERCENTAGE OF GDP



Sources: *INE* and Banco de Portugal.

Note: (p) – projected.

per cent in 2013. These projections reflect a deceleration in the energy component of the HICP in 2012 (from 12.8 per cent to 9.3 per cent) and a 0.2 per cent decline in 2013, largely reflecting the assumptions for oil prices in euros, whereas the non-energy component is projected to remain stable in 2012 (at 2.3 per cent) and decelerate significantly to 1.1 per cent in 2013 (Chart 7).

The stabilisation of the inflation rate in the 2011-2012 period at values which are relatively high given developments in its usual explanatory factors largely reflects increases in administered prices and the rise in indirect taxation. In the context of the deteriorating labour market situation, these increases are not expected to feed through to wages. Growth of administered prices is expected to reach 5.5 per cent in 2012, whereas the contribution of indirect taxation to inflation in 2012 is projected to be close to 2 p.p., largely reflecting the changes in VAT rates implemented in October 2011 (in the case of natural gas and electricity) and in January 2012. In 2013, in tandem with the fading out of these effects, the contribution of indirect taxation to inflation will be virtually nil, and administered prices are expected to grow less than 2 per cent. The behaviour of consumer prices is therefore expected to be more in line with macroeconomic developments.

Current projections point to a decline in unit labour costs in the private sector in 2012 and 2013, in an environment where wages developments are projected to be strongly affected by the deterioration of the labour market situation. Furthermore, wage growth in 2012 will be influenced by the impact of the suspension of holiday and Christmas bonuses in the public sector, and by the 50 per cent cut in overtime payments, which is scheduled to enter into force this year. Import prices of non-energy goods are projected to decelerate over the projection horizon from 5.2 per cent in 2011 to 3.4 in 2012 and 1.4 per cent in 2013.

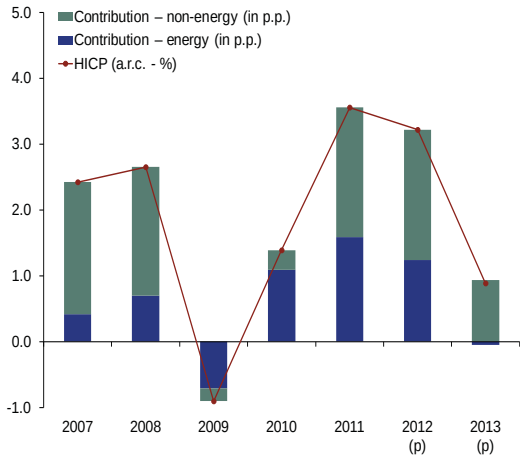
Projections for the inflation rate have remained virtually unchanged from the winter issue of the Economic Bulletin.

Risks of more unfavourable economic activity developments and balanced risks for inflation

Risks inherent in current projections point mainly to the possibility of more unfavourable developments in economic activity, *vis-à-vis* central scenario projections. These risks are largely the result of external factors, due to the persisting high uncertainty surrounding the resolution of the sovereign debt crisis in the euro area. Indeed, notwithstanding the favourable impact of non-standard monetary policy meas-

Chart 7

INFLATION | CONTRIBUTION TO THE ANNUAL RATE OF CHANGE OF THE HICP



Sources: Eurostat and Banco de Portugal.
Note: (p) – projected.

ures adopted by the Eurosystem in late 2011 and early 2012, risks remain of further intensification of interaction mechanisms either between the financial system and the real economy, or between the euro area and the world economy, particularly in the context of the fiscal consolidation plans currently under way in several economies. Against this background, the deceleration in external demand envisaged in the current projections may assume a more expressive or persisting role, with a negative impact on Portuguese exports. At the domestic level, a deterioration of the macroeconomic scenario could lead to the need to adopt additional measures ensuring compliance with the fiscal objective. The risks associated with inflation projections are balanced. On the one hand, the materialisation of risks regarding the projections for economic activity may tend to translate into lower price growth. On the other hand, the possibility of an increase in indirect taxation and administered prices, due to the possible need for additional fiscal consolidation measures, would feed through to an increase in inflationary pressures. Furthermore, possible disturbances in oil supply in the current geopolitical context lead to increased uncertainty as to developments in this commodity price.

Conclusion

Over more than a decade, in a context of extremely benign financial conditions, the Portuguese economy has accumulated sizeable imbalances, due to economic policies and agents' behaviour that were largely inappropriate to the requirements of the new regime emerging from Portugal's integration in the euro area. This has translated into unsustainable indebtedness levels of the public sector, corporations and households, and relevant imbalances in the banking sector financing structure. The Portuguese economy has thus been faced with large vulnerabilities in meeting the increasingly adverse financial conditions observed since 2007-2008. These vulnerabilities have been aggravated by an expansionary fiscal policy, in a context of growing financing costs and increased credit risk segmentation in financial markets, in particular for euro area debtors, thus making it inevitable for the Portuguese State to negotiate an international financial assistance programme in April 2011.

An evaluation of the EFAP enforcement by the European Union and the IMF reveals that the programme, overall, has been fulfilled: the general government deficit stood at approximately 4 per cent of GDP, i.e. below the maximum level determined in the EFAP (5.9 per cent of GDP), even though benefitting from significant extraordinary measures (4 per cent of GDP); the banking sector has carried on its deleveraging process and has strengthened solvency; at the structural level, a number of changes have been introduced in the regulatory framework, covering such different areas as the financial sector, justice, competition policy and labour market.

These results must not induce less attention to future challenges. The correction of macroeconomic imbalances in the Portuguese economy involves a protracted adjustment both of expenditure levels in the public and private sectors and of the leverage degree in the banking sector. However, the deleveraging process must assume and orderly and gradual nature, without compromising the financing of the most competitive sectors in the economy, requiring continued monitoring by the authorities, as laid down in the EFAP. The manner in which these essential objectives are to be met will constrain the trend of economic activity and employment in forthcoming years. A successful adjustment of the Portuguese economy requires a substantial improvement in the quality of the driving factors of potential growth and, in particular, of the institutional framework. The strict implementation of the structural transformation measures envisaged in the EFAP, not only at the legislative level, but chiefly as regards their effective implementation, is thus essencial so that the Portuguese economy may attain a sustainable growth path.

ARTICLES

III

COMPETITION IN THE PORTUGUESE ECONOMY: A VIEW ON TRADABLES AND NON-TRADABLES*

*João Amador***| *Ana Cristina Soares***

ABSTRACT

This article analyzes competition indicators in the Portuguese economy in the period 2000-2009, focusing on the differences between tradable and non-tradable sectors. The article computes the Herfindahl-Hirschman index and the price-cost margin, i.e., classical concentration and profitability measures, for a large set of markets. The analysis carried out is fundamentally distinct from the one conducted by competition authorities, aiming to set an overall scenario for competition developments. The article concludes that, although there are apparently no widespread problems, there is substantial room for improvements in the business competition environment in several markets, notably in the non-tradable sector.

1. Introduction

Competitive markets are a key ingredient in medium and long term economic growth and the intervention of public authorities is sometimes warranted to correct competition related distortions. Several aspects are acknowledged as important to assure a competitive business environment. Firstly, free-entry and exit of firms and low administrative costs tend to generate greater market competition, leading to higher productivity and investment. Free entry implies an increase in efficiency because prices tend to be drawn closer to marginal costs, implying an efficient allocation of resources in the economy, i.e., *static efficiency*. In this context, firms tend to become more efficient, cutting waste and duplication, which means higher productive efficiency. Companies that fail to undertake such adjustments are pressured to exit the market, freeing-up market quota for the most efficient ones. Secondly, a competitive business environment fosters innovation aimed at reducing production costs and creating new products. In the Schumpeterian perspective, the substitution of old technologies and products by new ones, relates with the concept of *dynamic efficiency*, which is determinant for total factor productivity growth. The effects of increased competition on investment are rooted on firms' need to increase productivity and market shares, as discussed in empirical work by Alesina *et al*. (2005).

This topic is particularly relevant, given the low potential GDP growth rate and the macroeconomic imbalances currently present in the portuguese economy. In fact, it has been suggested that one of the causes for the present macroeconomic situation was the progressive reallocation of resources from the tradable to the non-tradable sector in the years preceding and following the accession to the monetary union in 1999. Such reallocation of resources might be related with competition issues, as suggested by the path of market concentration and profit margins. Therefore, the aim of this article is to provide

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empirical evidence on cross-sector competition developments in Portugal, focusing on the distinction between tradable and non-tradable sectors. Although this approach is fundamentally different from the in-depth market investigations carried out by competition authorities, it provides a broad cross-sectoral perspective along a relatively long time span (2000-2009).

Studies on market power based on sectoral aggregate and firm-level data exist for many countries and could be organized along two different strands. The first strand of research is based on regressions, departing from growth accounting equations and profit maximization firms under imperfect competition (Hall (1988) and Roeger (1995)). Some empirical works based on sectoral aggregate data are Martins and Scarpetta (1999), Christopoulou and Vermeulen (2008) and Badinger (2007). Examples using firm--level data are Altomonte et al. (2010), Kiyota et al. (2009) and Estrada (2009). The second strand of research consists in the computation of markups from firm-level data or national accounts. Examples of studies with firm-level data are Altomonte et al. (2010) for 8 EU countries, Braila et al. (2010) for Belgium, Maliranta et al. (2007) for Finland and Creusen et al. (2006) for Netherlands, who have also used different competition indicators. The latter strand of research, adopted in this article, also takes into account firm-level heterogeneity, which is disregarded in regression based studies.

There are almost no studies on sectoral competition developments in the portuguese economy. One exception is Molnar and Bottini (2010), who used firm-level data from the Amadeus database and estimated markups for services sectors from 1993 to 2006. The authors concluded that Portugal, along with central European OECD countries, Italy and Sweden, presents high markups in services markets comparatively to a large set of European countries.

The article is organized as follows. The next section, briefly reviews two classical competition indicators - the Herfindahl-Hirschman index and the price-cost margin. Section 3 presents the databases and the classification of tradable and non-tradable markets. Section 4 presents the results for individual markets and section 5 reports sectoral aggregations and results for the overall economy. Finally, section 6 presents some conclusions.[1]

2. Classical measures of competition

2.1. Herfindahl-Hirschman index

The index attributed to Herfindahl (1950) and Hirschman (1945) (HHI) is one of the most popular empirical indicators in the competition literature. This index adequately assesses competition when concentration is the result of both an unequal distribution of market shares and a reduced number of market players. The HHI links market concentration with competition because the former leads to a higher likelihood of collusive behaviour and higher ability to set prices above marginal costs, that is, a lower level of competition. Although facing some methodological limitations, the HHI is a classical tool for preliminary analysis by regulatory authorities. The HHI in industry j is defined as:

$$HHI_j = \sum_{i=1}^{N} s_i^2$$

Where N is the number of firms in industry/market j and s_i stands for the market share of firm i. The HHI index ranges from close to 0 in perfect competition to 1 in monopoly.[2] When there are n equal

1 Additional results and further detail on the subject of the current article can be found in "Competition in the Portuguese economy: An overview of classical indicators", Banco de Portugal, Working Paper 8 /2012.

2 Alternatively, the index is scaled by 10000 if the market shares s_i are set in the interval $[0,100]$.

firms HHI equals $\frac{1}{n}$. Empirical literature usually defines $HHI < 0.1$ as the threshold for low levels of concentration, $0.18 \geq HHI \geq 0.1$ for moderately concentrated markets and $HHI > 0.18$ for highly concentrated markets (see for example Scheffman et al. (2002)). In addition, authorities accept or block mergers and acquisitions depending on the level and magnitude of the change in the HHI.[3]

The HHI presents some conceptual and empirical implementation problems. Firstly, it fails to correctly identify reallocation and selection effects which may result from higher competition associated to an increase of incumbents' aggressiveness. In this case, market shares of more efficient firms will increase at the expense of less efficient ones, leading to a reallocation effect. In addition, less efficient firms may be pushed out of the market, leading to a selection effect. In the latter case, HHI increases convey the wrong signal in terms of competition. The inability to capture reallocation and selection effects is extensive to all competition measures based on market shares. Secondly, the correct computation of the index requires information about all firms operating in the market. This is limitative when databases represent only a sample of firms, especially if observed entry and exit simply results from changes in coverage. Thirdly, information on firm's sales includes exports, thus affecting the assessment on domestic market concentration. Moreover, imports are also relevant to assess domestic market competition, thus inducing an additional potential bias. One should refer that this bias is more severe in markets associated to stronger exposure to international trade. This aspect is particularly important in the case of tradable markets, limiting the interpretation of results. Finally, the level of the HHI strongly depends on the definition of market.

2.2. Price-cost margin

From a theoretical point of view market competition is closely related to market power. The higher the latter the lower the level of competition is. Market power is defined as the ability to set prices above marginal costs. The classical measure of market power is the Lerner (1934) index, also referred as mark-up ratio. For a profit maximizing firm, this ratio is defined as the difference between price and marginal cost divided by price. The first order condition of the profit maximization problem of the firm is:

$$P(Q) + \frac{dP}{dQ}(1+v)q_i = MC(q_i)$$

where q_i is the production of firm i, MC is the marginal cost, Q and P stand for total production and price, respectively, and $(1+v)$ is the common conjectural variation.[4] The Lerner index for firm i is:

$$L_i \equiv \frac{P_i - MC_i}{P_i} = \frac{s_i(1+v)}{\varepsilon}$$

where $\varepsilon \equiv -\frac{dQ}{Q} / \frac{dP}{P}$ is the elasticity of demand and s_i is the market share of firm i.

The Lerner index equals 0 in the polar case of perfect competition, increases with market power and it is lower than 1 in monopoly. Detailed information on prices is generally not available and marginal costs are unobserved, thus the price-cost margin (PCM) is used as an approximation to the Lerner index. The PCM for firm i is considered as:

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3 For example, the guidelines in the US in 1982 set critical HHI levels for concentration: 0.1 with a change of 0.01 and 0.18 with a change of 0.005.

4 The conjectural variation defines how a firm anticipates the response of a competitor to changes in its production. Depending on the values of v, the first order conditions for various competitive models emerge. When the Cournot quantity model is considered $v = 0$, i.e., each firm believes the other firm's choice is independent from its own; when the perfectly competitive model is considered $v = -1$, implying a price equal to marginal cost; when v equals the slope of the reaction curve of the other firm, the Stackelberg model emerges, *i.e.*, the first firm chooses its output on the basis of how it conjectures the other firm will respond. Finally, when a monopoly is considered, the conjectural variation does not exist as total production is attached to one firm.

$$PCM_i = \frac{\text{Sales}_i - \text{Variable Costs}_i}{\text{Sales}_i}$$

Sales comprise revenues from the transaction of goods and services and variable costs consist of the cost of materials, cost of services (e.g., subcontractors, electricity and fuels) and labour costs. More specifically, labour costs include wages, other compensation items and social security contributions. Capital is assumed to be a fixed input, thus its cost is not included in variable costs.[5] Therefore, rents should be excluded from variable costs, though this was not the case in this article. The reason is that the response rate regarding this variable is small in the database, thus its exclusion from total costs of services might induce another type of bias in the results.

There are several sources of bias that limit the ability of the PCM to work as a measure of market power. Firstly, as marginal costs are unobserved, average costs are used as a proxy. In the case of constant returns to scale both measures coincide but in the presence of decreasing (increasing) returns to scale, there is an upward (downward) bias in the level of PCM. Secondly, the PCM also reflects product quality and efficiency levels. In fact, more efficient firms or those producing higher quality goods present higher PCM, though they do not necessarily hold higher market power. Thirdly, market PCM is not monotone in the degree of competition. The reason for the lack of theoretical robustness is its inability to correctly capture the previously mentioned reallocation and selection effects. These effects occur if efficient incumbents adopt more aggressive pricing strategies. In this case, market PCM may increase as a consequence of a transfer of market share towards such firms, suggesting that there was a competition reduction when in fact the opposite has occurred. Finally, PCM evolution also reflects the business cycle. In periods of expansion, firms have scope to increase the PCM and the reverse tends to happen in recessions, *i.e.*, the indicator has been found as mildly pro-cyclical in some empirical studies.

The computation of PCMs by market involves two steps. The first step is the definition of markets, *i.e.*, the implicit selection of firms operating there. The standard approach in the literature is to use a sectoral classification such as CAE as a market segmentation criterion.[6] The underlying assumption is that firms sell one good and compete in only one market. Therefore, multi-product firms are a source of bias, especially if products are not close substitutes. Different market segmentation criteria could yield different results. The second step is the aggregation of firm-level PCMs. Assuming that all firms have the same weight, market PCM corresponds to the unweighed average of firm level results. However, this approach can yield a distorted scenario for the market PCM because there is a significant level of heterogeneity across firms. Alternatively, weights can be assigned according to firm's market shares, which is the standard approach in the literature. Therefore, the relevant distribution becomes $s_i PCM_i$. Weights can be either time dependent or fixed at values recorded in a selected period. The former option implies an evolution in market PCM that results from changes both in firm-level PCM and market structure.

3. Database and market classification

3.1. Database description

Data used in this article draws on firms' annual accounts reported under *Informação Empresarial Simplificada* (Simplified Firm Information, Portuguese acronym: IES). IES data exists from 2006 onwards and it covers virtually the universe of Portuguese non-financial firms. Although IES began in 2006, there was a report including information for 2005, which was taken into account in the analysis. The

5 In the literature, alternative definitions are used. Some authors include taxes and subsidies, others argue that R&D expenses and the depreciation of intangible goods are related to efficiency, thus they should be included in variable costs.

6 CAE is the portuguese acronym for classification of economic activities and it is basically equivalent to NACE.

last year of this study is 2009, comprising around 350.000 firms. The almost universal coverage of IES emerges from its nature, as it is the system through which firms report mandatory information to the tax administration and the statistical authorities. Under IES, firms provide detailed balance sheets and profit and loss accounts information, as well as additional information on variables such as the number of employees and exports. Prior to 2006, information on the annual accounts of Portuguese firms was collected under a non-compulsory survey named *Central de Balanços* (CB).[7] This survey presented lower coverage in terms of number of firms and gross value added (GVA), with a bias towards large firms. *CB* data was used from 2000 to 2004.

In this article, only a subset of the data was used. Firstly, public sector related activities such as education and health care were not included. Moreover, agriculture, hunting and forestry along with mining and quarrying were not considered given their low weight in total GVA. Secondly, markets which do not have at least one firm in all the years were not considered. Overall 166 markets were considered, each one corresponding to a CAE 2.1 classification at 3 digit level.[8] Thirdly, firms with null sales or variable costs were excluded but those that do not report labour costs were included. Lastly, firms with negative PCM were included in the analysis. In the short-run, profit maximization is consistent with the existence of non-positive PCMs. If revenues cover at least fixed costs, firms incur in losses lower than those that would be registered if they exited the market. For this reason losses do not immediatly determine an exit. Nevertheless, the lowest 1 per cent observations in the pooled distribution of PCMs were eliminated, consisting of unreasonably negative values.

The final data set includes 1.368.551 firms/years, from 2000 to 2009, comprising 342.764 different firms. Almost half of the firms have at least 5 observations and around four fifths are present in two consecutive years, which implies a significant level of firm dynamics.

3.2. Classification of tradable and non-tradable markets

One of the main restrictions to firms' market power is exposure to international competition. Markets with strong international exposure are likely to follow the law of one price and are commonly classified as tradable. A rough proxy used in the empirical literature is to consider manufacturing markets as tradable and non-manufacturing as non-tradable. The problem with this proxy is that technological progress and trade liberalization brought international competition to many services activities, moving the borderline between tradable and non-tradable markets.

The empirical literature on this issue is scarce. Gregorio et al. (1994) use the export to production ratio as a measure of international exposure and set the threshold at 10 per cent. Under this approach, the use of manufacturing as a proxy for the tradable sector seems to be quite accurate, though the analysis was conducted at a high level of aggregation. Using a different methodology, Jensen and Kletzer (2010) provide a distinction based on a detailed market classification, uncovering a significant level of heterogeneity in services and classifying several of them as tradable. The export to sales ratio is one good measure to evaluate exposure to international competition, though a bias may exist because imports are ignored. In addition, it is assumed that firms in one market account for all the exports in that market.

Panel a) of Chart 1 plots the distribution of the export to sales ratio in portuguese markets, distinguishing between manufacturing and non-manufacturing markets for the average of the period 2006-2009. It is clear that several non-manufacturing markets exhibit high export to sales ratios. In this article, markets

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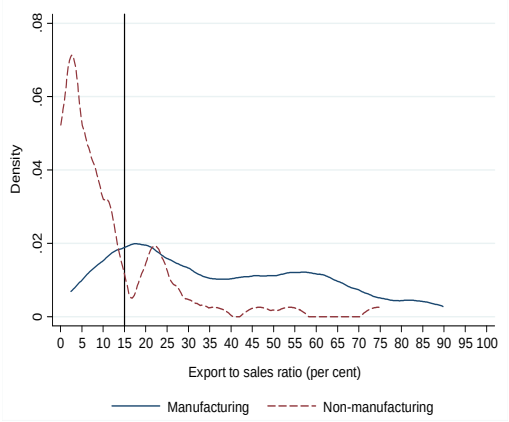
7 Activities such as "financial intermediation", "public administration and defense; compulsory social security" and "extra-territorial organizations and bodies" are not part of *IES* or *CB* universe.

8 In 2006 there was a change from CAE 2.1 to CAE 3.1. In order to ensure comparability an equivalence table was used. In addition, as significant reclassification of firms was prevalent in the database in the years before 2005, whenever possible, the classification resulting from the conversion from CAE 3.1 to CAE 2.1 was applied retrospectively.

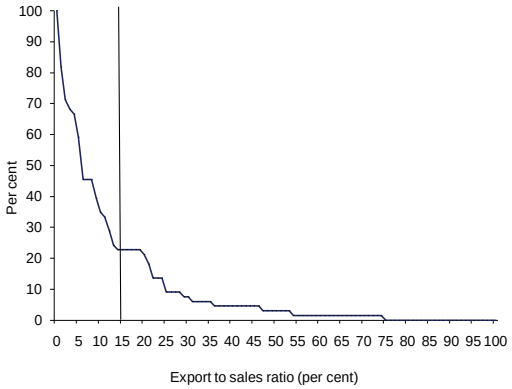
Chart 1

CLASSIFICATION OF TRADABLE AND NON-TRADABLE MARKETS

a) Distribution of export to sales ratio in 2006-2009



b) Thereshold sensitivity: accumulated distribution of non-manufacturing markets by export to sales ratio



Source: Author's calculations.

with an export to sales ratio above 15 per cent (the vertical line in Chart 1) are considered as tradable, along with all manufacturing markets.[9] Using this criterion, around 23 per cent of non-manufacturing markets are considered as tradable. Overall, in this article, the tradable sector includes all manufacturing markets, some transport related markets and some business services. This sector corresponds to a total of 115 markets representing 44 per cent of GVA in the average of the period 2005-2009.

The choice of a 15 per cent threshold for the exports to sales ratio is consistent with similar studies (Knight and Johnson (1997) and Dixon *et al*. (2004)) and it is quite robust for Portuguese data. Panel b) of Chart 1 shows that the percentage of non-manufacturing markets classified as tradable would not change for thresholds between 14 and 19 per cent.

4. Competition in the Portuguese economy

4.1. Concentration

Panels a) and c) of Chart 2 present Gaussian kernels for the HHI in 2009, unweighted and weighted according to average GVA in the 2005-2009 period, respectively. In both panels, the distinction between tradable and non-tradable sectors was maintained. It should be mentioned that HHI levels for the tradable sector are less informative as the relevant market is likely not to coincide with the internal market.

Unweighted kernels for HHI show that there is a high density in relatively low concentration levels, *i.e.*, the distributions are positively skewed, especially in the non-tradable sector. In 2009, average HHI in the tradable sector is 0.16, much higher than 0.098 in the non-tradable. However, there is still substantial density for HHI levels above 0.18, the threshold typically set to identify highly concentrated markets, notably in the tradable sector (13 per cent of non-tradable markets and 38 per cent of tradable markets were highly concentrated in 2009). Nevertheless, when markets are weighted according to GVA, the distributions for tradable and non-tradable markets become more alike and density in low concentration

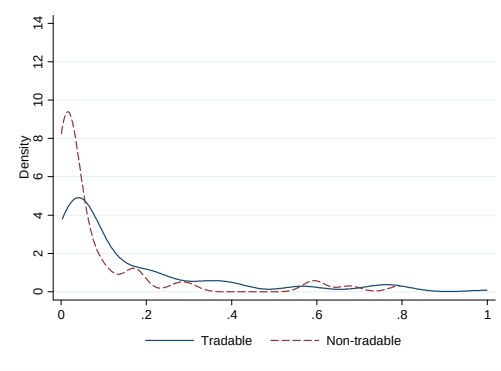
9 Market's exports are proxied by the sum of exports of firms within that market. Statistical data for exports of services are not published at the disaggregation level used in this article.

Chart 2

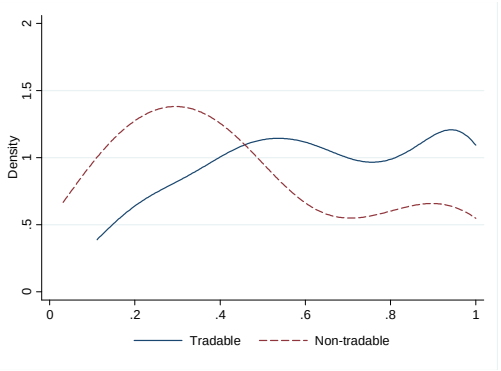
DISTRIBUTION OF HERFINDAHL-HIRSCHMAN INDEX (HHI) AND CONCENTRATION RATIO (C10) IN 2009

Unweighted

a) HHI

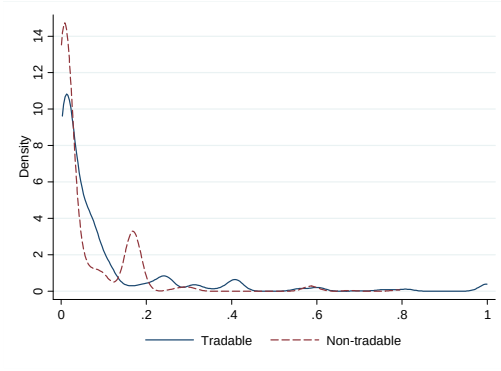


b) C10

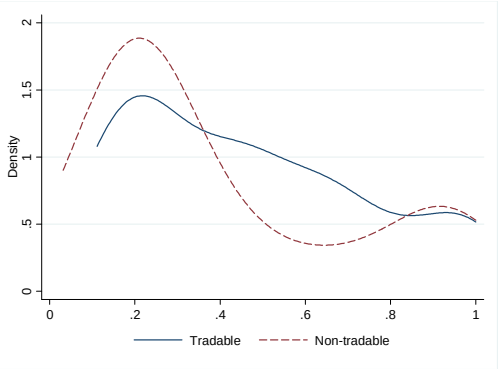


Weighted according to GVA

c) HHI



d) C10



Font: Author's calculations.
Note: Markets are defined using 3 digit level in CAE 2.1. The total number of markets considered is 166.

levels increases. This result suggests that there is a set of markets with low GVA weight and high levels of concentration. The analysis based on HHI suggests a predominance of low concentration markets, though the role of biggest firms should not be disregarded. It is important to note that the largest firms account for a significant share of total sales, especially in the tradable sector. However, this result is somewhat minimized when distributions are weighted according to GVA. That is visible in panels b) and d) of Chart 2, which plot the distribution of the share of the 10 largest firms in each market - C10. This fact should be taken into account in the competition assessment.

Market concentration trends are assessed in two ways. Firstly, the percentage of markets that record an increase in the HHI is presented for the two sample sub-periods, inferring on possible competition reductions. Secondly, the magnitude of those changes is decomposed according to classes of high, moderate and low concentration. In fact, if concentration increases in highly concentrated markets, there is an increased likelihood of collusive behaviour among incumbents. From a policy point of view, this is more worrying than when concentration increases occur in low concentrated markets.

Table 1 presents the percentage of markets that record an increase in HHI for the two sample sub-periods. Results are reported in relative terms, i.e., cases of potentially lower competition are adjusted for the total number of markets, GVA, sales or employment in the selected sector, depending on the weighting option. In the 2005-2009 period, 51 per cent of markets recorded increases in concentration. If these markets are weighted according to their GVA, sales or employment, concentration increases become significantly more relevant in the economy. For the overall economy, higher concentration is relatively widespread across markets and significant in terms of resources involved. Considering the period 2000-2004, the percentage of markets where concentration increased is lower (44 per cent), as well as the representativeness of these changes in terms of resources involved. Nevertheless, the coverage of the database in this period is much lower, which may have a particularly strong impact when concentration measures are computed. In addition, due to incomplete coverage, GVA, sales and employment weights used for 2000-2004 refer to the 2005-2009 period, implying that there is no structure effect when the two sub-periods are compared.

The results for the overall economy hide a substantial degree of heterogeneity across sectoral aggregates. In the period 2005-2009, although markets where concentration increases do not exceed 50 per cent in the non-tradable sector, the share of resources involved in terms of sectoral GVA, sales and employment is substantially higher. This means that the importance of non-tradable markets where concentration increased is higher in terms of resources involved than in terms of percentage of markets. This difference is less significant in the tradable sector. Overall, competition reductions are more significant in the non--tradable sector, though they affect a larger percentage of tradable markets.

The bottom panel of Table 1 considers a more detailed classification for non-manufacturing markets. The most striking result is in the "Construction" sector, where all markets recorded increases in HHI in the period 2005-2009. In the "Trade" sector, about half of the markets recorded increases in concentration and they represent about three quarters of resources used in the sector. In the period 2000-2004 the numbers are lower, especially for the "Trade" sector. At the opposite extreme is "Electricity and water supply", where the percentage of markets associated to higher concentration is low and totally unrepresentative in terms of resources used in this sector.

Upward concentration trends are particularly worrying if they occur in highly concentrated markets and they assume a non-tradable nature. Chart 3 breaks down increases in concentration along the three referred categories (high, moderate and low concentration) for the two sub-periods considered.

Table 1

INCREASES IN THE HERFINDAHL-HIRSCHMAN INDEX (PER CENT)

	CB (2000-2004)				*IES* (2005-2009)			
Weight	Markets	GVA	Sales	Employment	Markets	GVA	Sales	Employment
Overall Economy	44	43	44	57	51	63	65	69
Aggregates								
Tradable	50	52	46	61	53	57	60	62
Non-tradable	31	37	43	53	45	67	68	76
Non-manufacturing sector								
Electricity and water supply	25	0	0	0	25	12	6	58
Construction	60	97	98	98	100	100	100	100
Trade	38	27	39	32	46	78	73	72
Transports and communications	8	21	22	54	50	42	58	72
Other services	33	47	53	36	43	51	44	47

Source: Author's calculations.
Note: Markets are defined using 3 digit level in CAE 2.1. The total number of markets considered is 166.

It should be noted that the decomposition within each sector does not adjust for the structure in terms of concentration categories, *i.e.*, the fact that each category has a different weight within each sector is disregarded. The aim of this analysis is to assess the relevance of competition reductions in the economy and not to draw conclusions in terms of incidence of competition reductions by concentration category. Therefore, increases in concentration occurring in highly concentrated markets are analysed, while keeping their relevance in the total distribution of markets in the sector.

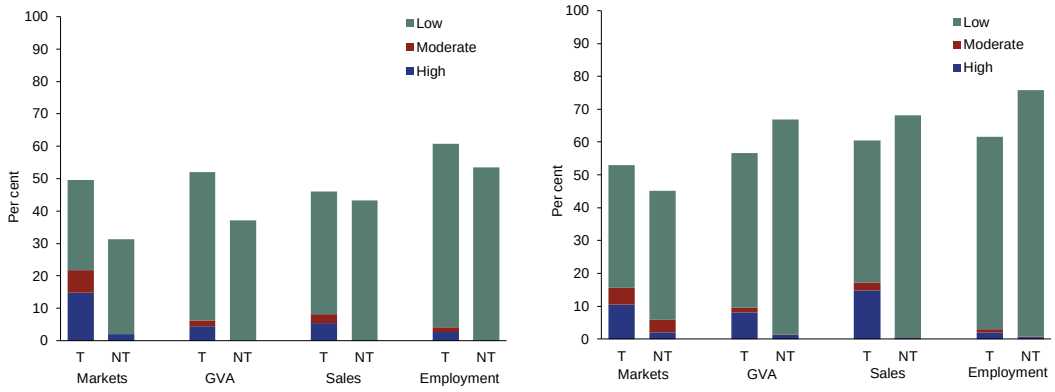
Chart 3 shows that most of the markets where concentration increased present low average levels of HHI, both in 2000-2004 and 2005-2009 periods, particularly in the non-tradable sector.[10] In the tradable sector, about one fifth of markets that increased concentration in the second sub-period belong to the high concentration category, being also relevant in terms of GVA and sales involved.

A complementary approach consists in computing the percentage change in the HHI for each market in the two sub-periods. Chart 4 ranks markets according to these rates of change and signals non-tradables with black bars. The first result is that both tradable and non-tradable markets stand amongst those with the highest and lowest rates of change, implying once more a very heterogeneous scenario in terms of economic activities. Several non-tradable markets stand amongst those with the lowest (negative) percentage changes in concentration in the period 2000-2004. The highest percentage increases in the 2005-2009 period are related to more capital intensive manufacturing sectors such as "Manufacturing of other chemical products" (CAE 246) but also "Manufacture of jewelery and related articles" and services like (CAE 362), "Architectural and engineering activities and related technical consultancy" (CAE 742). Strongest concentration reductions in this period include "Legal, accounting, book-keeping and auditing activities; consultancy" (CAE 741), "Manufacture of rubber products" (CAE 251) and "Forging, pressing, stamping and roll forming of metal; powder metallurgy" (CAE 284).

Chart 3

BREAKDOWN OF INCREASES IN CONCENTRATION FOR TRADABLE (T) AND NON-TRADABLE SECTORS (NT)

a) *CB* (2000-2004) b) *IES* (2005-2009)



Source: Author's calculations.

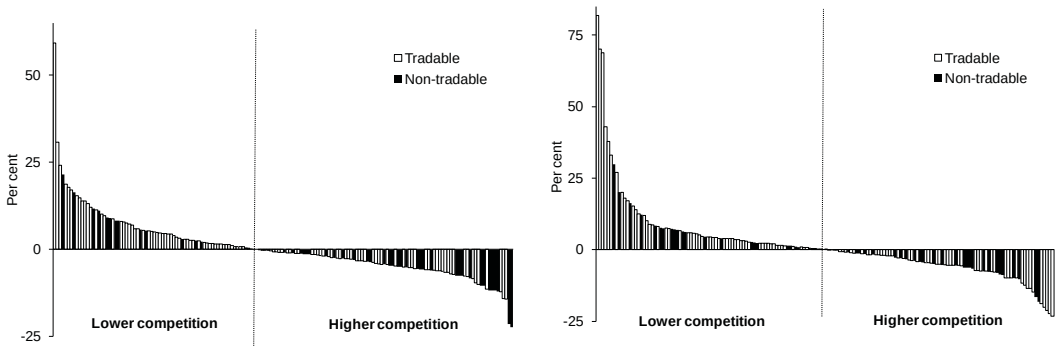
Note: Markets are defined using 3 digit level in CAE 2.1. The total number of markets considered is 166.

10 The classification of markets bases on average levels of concentration and it is naturally affected by the change observed in the indicator. Although this option may increase the percentage of markets classified as highly concentrated, it is more robust than classifying a market basing on a single year of HHI. Robustness tests confirmed that, under the current approach, the number of markets transiting to higher categories is insignificant.

Chart 4

CHANGE OF HERFINDAHL-HIRSCHMAN INDEX BY MARKET

a) *CB* (2000-2004) b) *IES* (2005-2009)



Source: Author's calculations.
Note: Markets are defined using 3 digit level in CAE 2.1. The total number of markets considered is 166.

4.2. Profitability

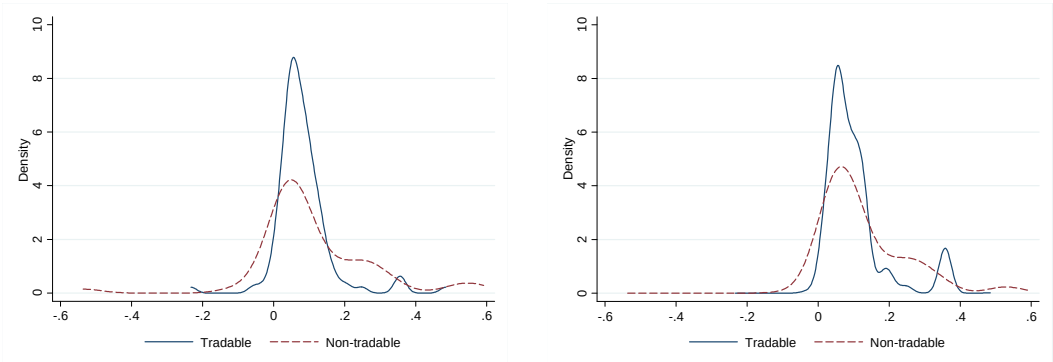
The assessment of profitability in different markets follows the same structure adopted for concentration in the previous subsection. Chart 5 presents the PCM Gaussian kernels across markets (computed from firm-level PCM weighted according to its market share), adopting the sectoral classifications previously presented. Panel a) presents unweighted kernels and panel b) weighted kernels according to average GVA for the 2005-2009 period.

The tradable sector presents an unweighted average PCM of 8.1 per cent in 2009, which compares with 11 per cent in the non-tradable sector. The kernels for PCM suggest that the distribution is substantially more concentrated for the tradable sector, i.e., tails are heavier in the non-tradable distribution. In 2009,

Chart 5

DISTRIBUTION OF PRICE-COST MARGIN ACROSS MARKETS IN 2009

a) Unweighted b) Weighted according to GVA



Source: Author's calculations.
Note: Markets are defined using 3 digit level in CAE 2.1. The total number of markets considered is 166.

90 per cent of tradable markets present PCM between 0 and 20 per cent. For non-tradable markets this density is much lower, reaching 62 per cent. There is also significant heterogeneity in PCMs across markets in the economy, mostly in the non-tradable sector. It should be noted that both tradable and non-tradable distributions remain unchanged when markets are weighted according to their GVA.

Table 2 presents the percentage of markets that registered an increase in PCM for the two sample sub--periods, signaling potential lower intensity of competition. Similarly to HHI, results are reported in relative terms and different weights are used.

In the 2005-2009 period increases in profitability are relatively generalized across markets (46 per cent) and significant in terms of resources (57, 57 and 52 per cent of GVA, sales and employment, respectively). For the overall economy, the main difference regarding concentration measures is that increases in market profitability are relatively less widespread across markets and less relevant in terms of GVA, sales and employment. In sectoral terms, in the 2005-2009 period, the percentage of non-tradable markets that registered an increase in PCM is higher than in the tradable sector. It is also more significant in terms of resources involved. In fact, 59 per cent of non-tradable markets record an increase in PCM, in contrast with 41 per cent in the tradable sector. In terms of resource allocation, non-tradable markets where profitability increased during the 2005-2009 period account for about two thirds of GVA, sales and employment in this sector. In contrast, only around 40 per cent of GVA, sales and employment in the tradable sector showed increases in PCM.

The analysis of the first sub-period shows a similar pattern, though the percentage of markets and the share of resources associated to tradable markets where profitability increased is higher. Similarly to concentration, average weights for 2005-2009 were used to aggregate profitability increases in the 2000-2004 period, eliminating the structure affect. It should be recalled that under *IES* market weights are based on the universe of firms, thus adequately reflecting the actual productive structure.

The bottom panel of Table 2 considers a more detailed sectoral classification for the non-manufacturing sector. Similarly to concentration measures the most striking result concerns the "Construction" sector, where all markets recorded increases in PCM in the period 2005-2009. In "Electricity and water supply" and "Other services" higher profitability is prevalent, suggesting lower competition. However, in the latter sector the share of resources involved is comparatively smaller. In the first sub-period, the "Construction" sector shows a lower percentage of markets with increases in profitability, though the percentage of GVA, sales and employment is already very high.

Table 2

INCREASES IN PRICE-COST MARGIN (PER CENT)

	CB (2000-2004)				*IES* (2005-2009)			
Weight	Markets	GVA	Sales	Employment	Markets	GVA	Sales	Employment
Overall Economy	50	59	54	64	46	57	57	52
Aggregates								
Tradable	46	51	50	54	41	44	42	37
Non-tradable	59	64	57	71	59	67	65	64
Non-manufacturing sector								
Electricity and water supply	75	21	19	64	50	91	87	93
Construction	40	92	95	91	100	100	100	100
Trade	46	41	45	37	50	55	56	48
Transports and communications	58	72	61	33	42	39	39	65
Other services	67	60	58	77	67	73	82	45

Source: Author's calculations.

Note: Markets are defined using 3 digit level in CAE 2.1. The total number of markets considered is 166.

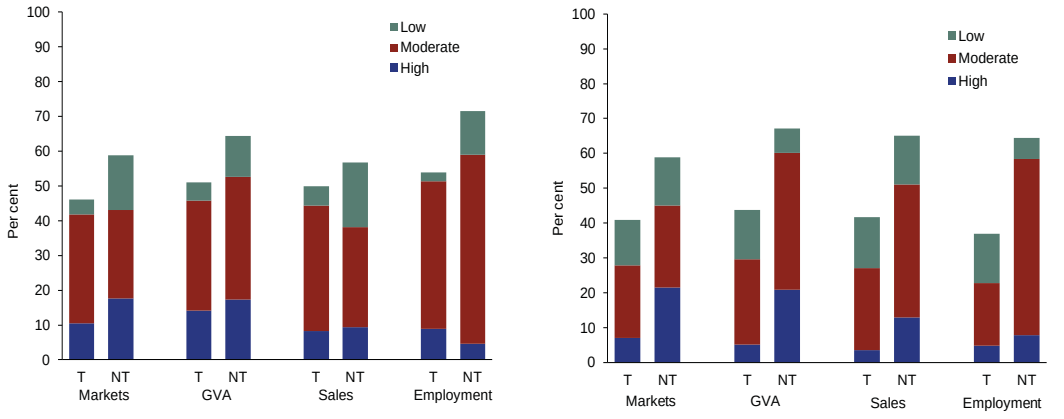
Similarly to concentration measures, it is important to break down the changes in market PCM according to average profitability categories, while keeping in mind the remarks on the interpretation of results. In this case, low, moderate and high profitability were defined, according to the 25th, 50th and 75th percentiles of the 2000-2009 overall PCM distribution (low profitability: $PCM < 4.6\%$, moderate: $11.8\% \geq PCM \geq 4.6\%$, high: $PCM > 11.8\%$). In this sense, increases in profitability in highly profitable markets may signal a stronger probability of collusive behaviour among incumbents, thus deserving more concern from a policy point of view. High PCMs are generally associated to markets with higher sunk costs and, consequently, higher entry barriers.

Chart 6 presents this breakdown and shows that, in both subperiods, the increase in profitability takes place mostly in moderately profitable markets. Nevertheless, there is a significant percentage of non--tradable markets where these changes are associated to cases of high average profitability, especially in the period 2005-2009 and involving an important share of this sector's GVA.

Profitability trends by market were estimated for the period 2000-2009. Although there is a break in series due to the different coverage of *CB* and *IES* databases, if it is assumed that *CB* is representative by market, it is possible to compute trends for the overall period.[11] Chart 7 ranks estimated profitability trends using PCMs, identifying those with a 10 per cent level of significance with light grey bars. It is particularly striking that a larger percentage of non-tradable markets present positive and significant profitability trends when compared with tradable markets (44 and 29 per cent, respectively), which confirms the analysis carried out above. In addition, only 56 per cent of non-tradable sectors record a negative profitability trend, as opposed to 71 per cent in tradable markets.

Chart 6

BREAKDOWN OF INCREASES IN PROFITABALITY FOR TRADABLE (T) AND NON-TRADABLE SECTORS (NT)



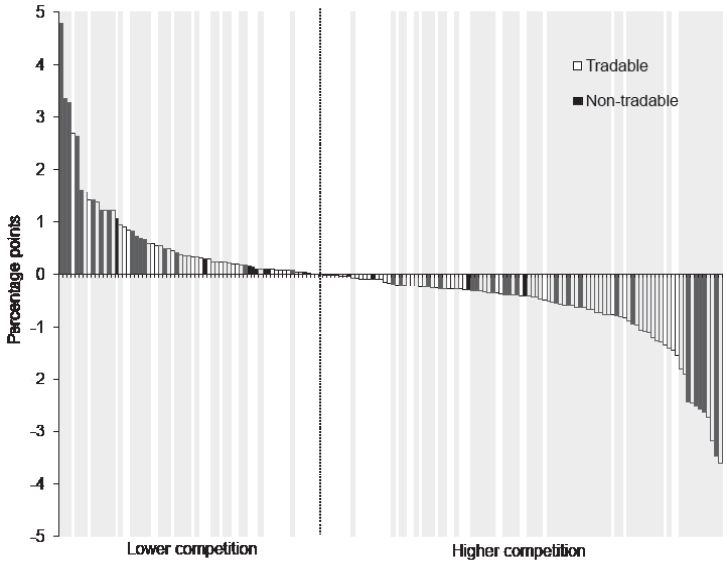
Source: Author's calculations.

Note: Markets are defined using 3 digit level in CAE 2.1. The total number of markets considered is 166.

11 Concentration trends were not estimated for the overall period because the break in the database severely affects the level of the HHI. Trends were computed using Newey-West standard errors assuming first order autocorrelation. Note also that PCM series may be non-stationary but the low numbers of degrees of freedom do not allow to test or correct for potential integration.

Chart 7

PRICE-COST MARGIN TRENDS BY MARKET (2000-2009)



Source: Author's calculations.
Note: Markets are defined using 3 digit level in CAE 2.1. The total number of markets considered is 166.

5. Market aggregates

Competition can only be adequately assessed at market level. In addition, HHI and PCM levels are not directly comparable across sectors due to, for instance, technological differences. Nevertheless, it is useful to compute aggregate competition measures both for policy analysis and calibration of macroeconomic models. Three levels of aggregation are considered: total economy; broad sectors; and tradables vs non--tradables. The variable used for aggregation was the GVA share for the average of the period 2005-2009, thus eliminating effects coming from changes in the structure of the economy. Other weighting possibilities include sales or employment.

The aggregation based on sales is frequently used in the literature, having the advantage of chaining with the aggregation of firms in a market. The disadvantage of this option is the non consideration of the true relevance of markets for each sector, overstating a decrease in competition in a sector of high sales but very little GVA or employment. Nevertheless, it should be noted that the relevance of each market in terms of competition may not be truly perceived through its GVA share. In fact, specific markets with low GVA share can be extremely relevant as they may be important inputs in other markets. If the aggregation were based on sales, results would be very similar except for tradable and non-tradable sectors. In these sectors average profitability rates in the period 2005-2009 would be 8.4 and 7.9 per cent, respectively, against 10.0 and 11.7 per cent using GVA. In this period, total PCM in the economy with an aggregation based on sales would be 8.1 per cent. In any option the annual path of PCMs is qualitatively similar because fixed weights are used in the aggregation.

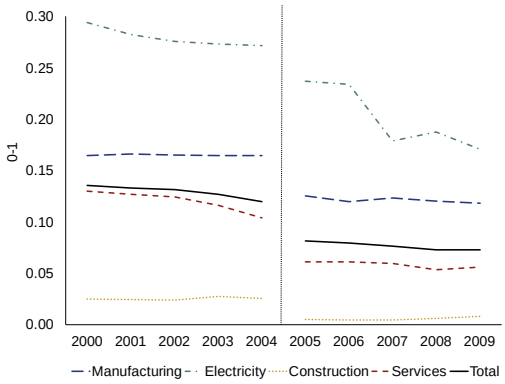
Chart 8 presents the results obtained for HHI and PCM, respectively.[12] As mentioned before, levels of concentration and profitability indicators reflect not only competition but also a set of market features such as technology, sunk costs, elasticity of substitution, elasticity of demand and exposure to international trade.

12 Given the existence of a series break in 2005, due to a change in coverage associated with the transition from *CB* to *IES* database, a blank is inserted in this year.

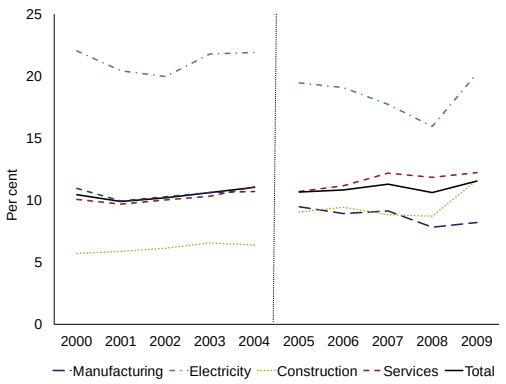
Chart 8

AGGREGATE CONCENTRATION (HHI) AND PROFITABILITY (PCM) (2000-2009)

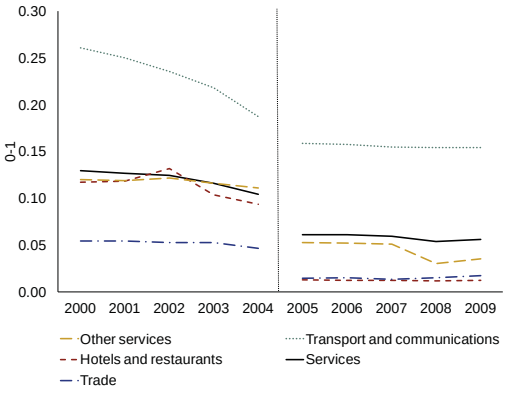
a) HHI



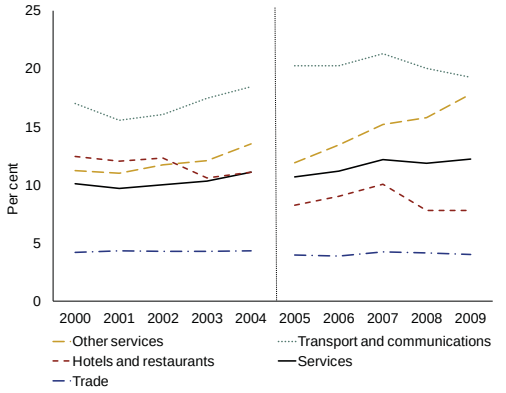
b) PCM



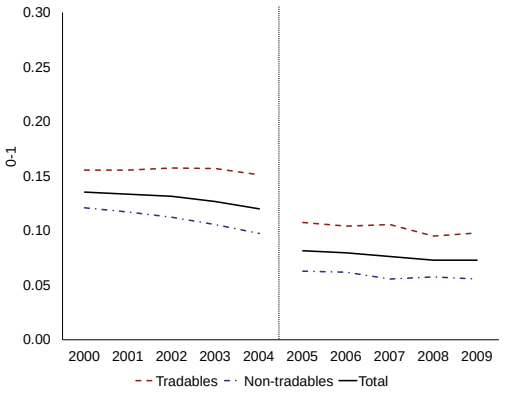
c) HHI



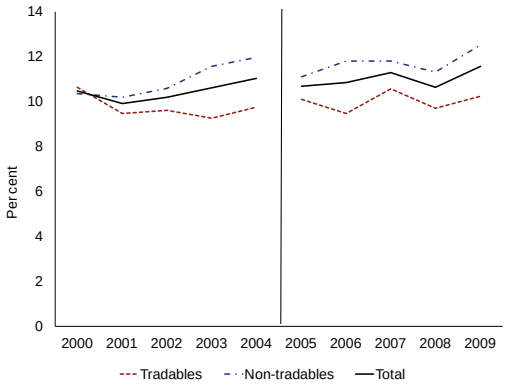
d) PCM



e) HHI



f) PCM



Source: Author's calculations.

Panels a), c) and e) present the HHI at the aggregate sectoral level. Panel a) reveals that there are substantial differences in concentration measures across sectors, reflecting different market structures. The "Construction" and "Services" sectors are the least concentrated, while "Electricity" and "Manufacturing" stand among the most concentrated. At the services level (panel c), "Trade" and "Hotels and Restaurants" present a strongly fragmented market structure, as opposed to "Transports" and "Communication". Considering the tradable vs non-tradable distinction (panel e), it is clear that there are no visible trends in the evolution of concentration but the level of the HHI is higher in the former group. As previously mentioned, HHI levels are less informative in the case of the tradable sector as the relevant market is likely not to coincide with the internal market.

Panels b), d) and f) present the PCM at the aggregate sectoral level, following the structure and aggregation weights mentioned previously for the HHI. The PCM for the overall economy stood at near 11 per cent in the 2005-2009 period (panel a). The "Construction" and "Services" sectors recorded increases in PCM from 2005 to 2009, suggesting lower competition (panel b). In the 2000-2004 period a similar trend seems to exist. On the contrary, the "Manufacturing" sector shows a declining PCM in the period 2005-2009.

Considering a more disaggregated classification at the services level (panel d), it is visible that higher profitability is only sizeable in "Other business services" in the period 2005-2009 and in "Hotels and restaurants" between 2005 and 2007. Finally, given the criteria used for classifying tradable and non--tradable sectors, panel f) shows that the latter group of sectors increased profitability, while the tradable sector recorded a stabilization. This led to a slight increase in the overall economy in the period 2005--2009. In the 2000-2004 period an increase in profitability seems to have occurred in both sectors.

6. Concluding remarks

This article provides an overview of competition indicators in the portuguese economy in the period 2000-2009. The existence of a break in the database in 2005 leads to a segmentation of the analysis for the periods 2000-2004 and 2005-2009. This article covers classical concentration and profitability measures, focusing on the differences between the tradable and non-tradable sectors. The analysis carried out is distinct from that of competition authorities. These institutions accurately define the relevant markets and characterize firm's competitive behaviour, while our purpose is to establish an overall competition scenario.

The article concludes that, although there are no widespread problems, some markets offer large room for improvements in the competition environment, notably in the non-tradable sector. Around half of the markets in the economy record increases in concentration or profitability. More importantly, in terms of GVA, sales or employment involved in these markets, positive profitability and concentration trends turn out to be more relevant.

Positive concentration trends are more widespread in the tradable sector than in the non-tradable sector, though in this latter case they are more significant in terms of resources involved. In addition, markets where concentration increased are mostly those with low average levels of HHI, both in the 2000-2004 and 2005-2009 periods, especially in the case of the non-tradable sector.

Regarding profitability, positive trends are more widespread in the non-tradable sector than in the tradable sector. Similarly to concentration, the share of resources involved in these trends is relatively more relevant in the non-tradable sector. Another important result is that there are several non-tradable markets amongst those with high PCM and many of them recorded increases in profitability in the period 2005-2009. In addition, many of these markets also recorded increases in the PCM in the period 2000-2004.

The aggregate sectoral analysis, weighting individual market indicators according to their average share on total GVA, suggests that the non-tradable sector increased profitability while the tradable sector

recorded a virtual stabilization, leading to a slight increase in the PCM for the overall economy in the period 2005-2009. This conclusion seems to confirm the notion that there is substantial room to improve competition in the non-tradable sector, which would allow for a more efficient allocation of resources, favouring the correction of macroeconomic imbalances existing in the Portuguese economy.

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FISCAL INSTITUTIONS AND PUBLIC SPENDING VOLATILITY IN EUROPE*

*Bruno Albuquerque***

ABSTRACT

This article provides empirical evidence for a sizeable, statistically significant negative impact of the quality of fiscal institutions on public spending volatility for a panel of 23 EU countries over the 1980-2007 period. The dependent variable is the volatility of discretionary fiscal policy, which does not represent reactions to changes in economic conditions. Our baseline results thus give support to the strengthening of institutions to deal with excessive levels of discretion volatility, as more checks and balances make it harder for governments to change fiscal policy for reasons unrelated to the current state of the economy. Our results also show that bigger countries and bigger governments have less public spending volatility. In contrast to previous studies, the political factors do not seem to play a role, with the exception of the Herfindahl index, which suggests that a high concentration of parliamentary seats in a few parties would increase public spending volatility.

1. Introduction

Over the last decades, we have seen a general increase in government budget deficits along with large levels of public debt in most advanced countries. This trend had already been visible in the years preceding the implementation of massive fiscal stimulus, following the eruption of the 2007-08 financial crisis. Focusing on the period up to 2007, the widespread deterioration in fiscal discipline which induced greater fiscal policy volatility cannot be entirely explained by the existence of increasingly larger automatic stabilisers and welfare states. The answer for part of that deterioration and particularly for the rise in volatility appears also to rely on governments' aggressive use of fiscal policy for reasons not related to the current state of the economy.

In fact, what appears to be the norm is that fiscal policy is not conducted by benevolent governments, but rather by politically-motivated executives who do not necessarily share the same preferences as those of the majority of society. We call *discretionary fiscal policy* or simply *discretion* to this way of conducting fiscal policy. This definition is in the spirit of Fatás and Mihov (2003), who define discretionary fiscal policy as the component of fiscal policy that does not represent reactions to changes in economic conditions and that may only reflect exogenous political preferences. This definition excludes other discretionary measures aiming at responding to economic shocks, like government fiscal stimulus measures to boost the economy in recessionary periods. Structural reforms are also excluded from our definition of discretion, as they do not really reflect opportunistic decisions undertaken by governments.

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The literature presents some reasons that might explain why governments resort to discretion in fiscal policy. The opportunistic electoral cycle (Nordhaus (1975)) arises when politicians in power run expansionary fiscal policy in times when it is not necessary, in order to maximise their chances for re-election. Stokey (2003) argues that idiosyncratic changes, incompetence and greediness can define, in some occasions, the path that fiscal policy takes. Finally, the partisan electoral cycle advanced by Alesina (1987), i.e. changes in the ideology of parties in power, also help explain why some countries use more discretion in the conduct of fiscal policy. This aggressive use of fiscal policy would inevitably increase the volatility of public spending with negative consequences for economic growth, as it would produce high uncertainty surrounding the future path of fiscal policies. In this respect, Fatás and Mihov (2003, 2006) document that output volatility is larger in the presence of high levels of discretionary fiscal policy, whereas Fatás and Mihov (2003), and Afonso and Furceri (2010) show that government spending volatility is detrimental to economic growth.

In this context, where the volatility produced by discretionary fiscal policy harms economic growth, what can be done? The answer relies on a growing body of literature, *Political* or *Fiscal Institutions*, that has moved towards strengthening the quality of institutions, that is, the various characteristics of the socio-economic and political setup which considerably shape economic policy (Persson and Tabellini (2001)). The proposals to strengthen the quality of institutions range from measures to increase governments' accountability and policies' transparency, to more far-reaching ones, such as implementing fiscal rules (Debrun *et al*. (2008)) and improving the mechanisms and rules governing the budget process that create checks and balances over public finances (Fabrizio and Mody (2006), and Hallerberg *et al.* (2007)).

Moving forward, in this article we want to find out if there is any link between stronger fiscal institutions and lower values of discretionary public spending volatility. In our opinion, this article adds to the *Fiscal Institutions* strand of literature in four ways. Firstly, we build two major indexes for the quality of institutions to explain cross-country differences in policy volatility. Secondly, we cover the European Union (EU) countries, which offer a larger span of data availability and with better quality. Thirdly, we create panels of 10-year averages for the econometric specification, and this allows us to draw conclusions not only between countries but also over time. Finally, we conduct some robustness tests, particularly by using alternative measures to compute the volatility of discretionary fiscal policy.

In a sample of 23 EU countries in the 1980-2007 period, our baseline results point to a sizeable, statistically significant negative impact of the quality of institutions on public spending volatility, giving support to the strengthening of institutions to deal with excessive levels of discretion volatility. Our results also confirm the findings of Furceri and Poplawski (2008) that bigger countries have less volatility, while bigger governments are also associated with lower levels of volatility. In contrast with Fatás and Mihov (2003), and Afonso *et al*. (2010), the political factors do not seem to affect policy volatility. The exception is the Herfindahl index, which suggests that high concentration of parliamentary seats in a few parties would increase public spending volatility.

The remainder of the text is organised as follows. The next section explains the empirical two-step strategy that will be carried out. Section 3 presents and discusses the baseline results. Under Section 4, we conduct some robustness tests. Finally, Section 5 concludes with the main findings and policy implications, providing some avenues for future research.

2. Empirical strategy

In this section, we study the impact of the quality of institutions on the volatility of discretionary fiscal policy through a two-step strategy. Firstly, we compute a measure of discretionary fiscal policy volatility which does not represent reactions to changes in economic conditions. Secondly, we employ it as the dependent variable against a set of political, institutional and macroeconomic variables. The terms public spending volatility, (fiscal) policy volatility, and discretionary fiscal policy volatility will be used interchangeably throughout the text.

2.1. First-stage regressions: discretionary fiscal policy measure

Our sample covers 23 EU member states over the 1980-2007 period.[1] Using this sample of countries offers several advantages. In particular, we have a larger span of data availability for more variables than those that would be obtained from non-EU countries. In addition, data quality and cross-country comparisons are likely to be of a higher standard. We use annual data from the European Commission AMECO database for all fiscal and macroeconomic variables. Data on the political variables come from the Database of Political Institutions 2006 of the World Bank, and for political instability variables we use the Cross-National Time-Series Data Archive (CNTS).

In the first stage of the empirical strategy, we rely on the pioneering work of Fatás and Mihov (2003) in order to build a measure of discretionary fiscal policy that is driven by political motivations and which does not represent reactions to changes in economic conditions. Though following their econometric approach, we use primary government expenditure as the dependent variable, which is more comprehensive, instead of public consumption. We estimate for each of the 23 EU countries over the 1980-2007 period, the following equation:

$$\Delta log\left(G_{i,t}\right) = \propto_i + \beta_i \Delta log\left(Y_{i,t}\right) + \delta_i \Delta log\left(G_{i,t-1}\right) + \lambda_i Z_{i,t} + \varepsilon_{i,t} \qquad (1)$$

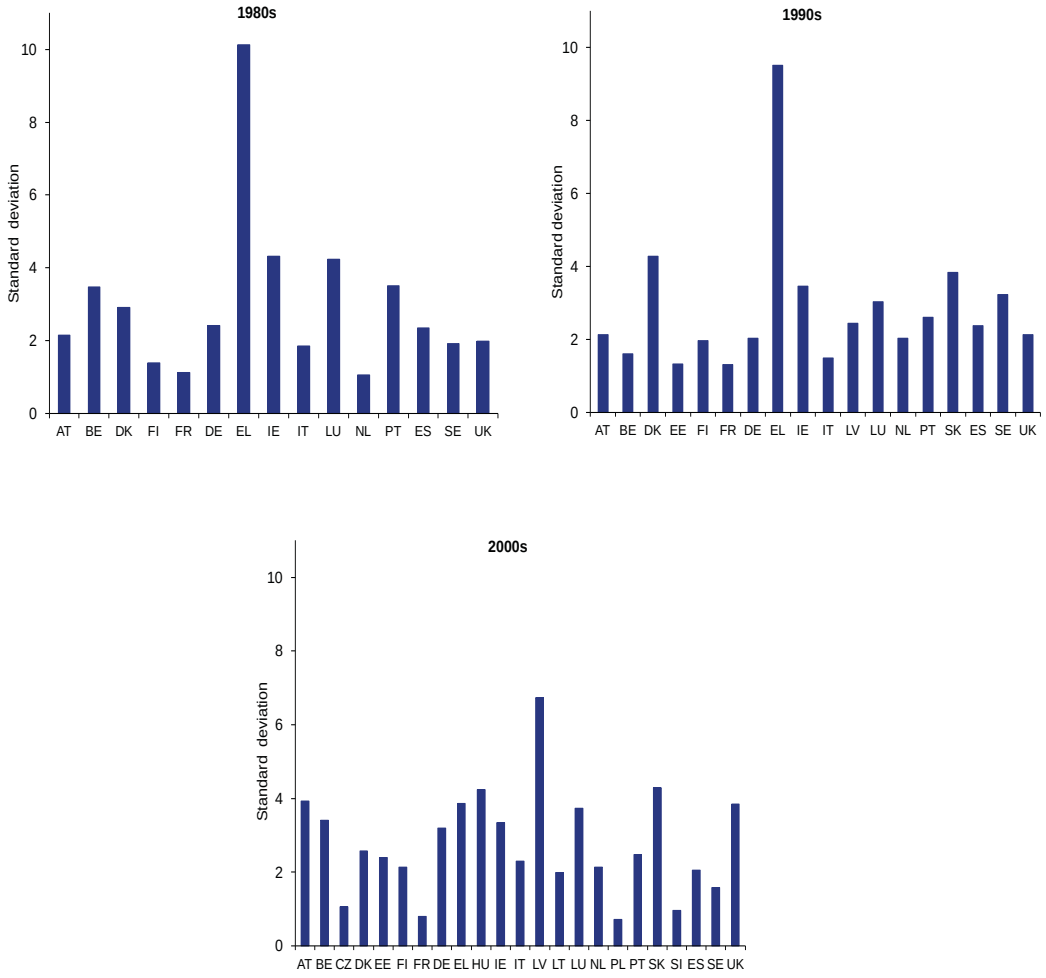
where the residuals ($\varepsilon_{i,t}$) play the most important role, as they capture the variation in government spending that is neither explained by changes in GDP growth, nor by the degree of persistence on its own past values. The volatility is calculated as the standard deviation of the residuals in country *i*, using periods of 10 years, since we want to capture long-term fluctuations in discretionary fiscal policy, removing therefore the noise that is associated with shorter periods. In this context, we interpret the volatility, sigma (σ_i^{ε}),as the typical size of a discretionary change in fiscal policy. Δ is the first difference operator, G stands for real primary government expenditure in country *i* and time t, Y is real GDP, and Z includes a set of control variables, namely, inflation, inflation squared, the logarithm of current and lagged oil spot prices, and a linear time trend. The possible reverse causality bias running from public expenditure via domestic demand to output growth is accounted for by using the instrumental variables (IV) estimator. We use two lags of GDP growth, lagged inflation and the logarithm of oil spot price as instruments for current output growth.

The volatility of discretionary fiscal policy (expressed in standard deviations) for each country and decade, calculated from Equation (1), is shown in Chart 1. In the 1980s, we only have data available for the former EU-15 countries, with policy volatility ranging between a maximum of 10.1 (Greece) and a minimum of 1.1 (Netherlands). Adding one more decade, and including three new countries (Estonia, Latvia and Slovakia), does not significantly change the overall picture. In the last decade, we cover all the 23 countries, where the discretion measure ranges between 6.7 (Latvia) and 0.7 (Poland). Overall, over time, Chart 1 shows a slight downward trend in the use of discretionary fiscal policy across countries, albeit with some exceptions.

1 Bulgaria, Cyprus, Romania and Malta were dropped due either to lack of data or to data availability problems.

Chart 1

VOLATILITY OF DISCRETIONARY FISCAL POLICY BY COUNTRY AND DECADE



Source: Author's calculations.

2.2. Second-stage regressions: determinants of policy volatility

Moving to the econometric specification for the second-stage regression, we include all the variables and controls that might be important to explain cross-country differences in policy volatility. We create a panel of three consecutive, non-overlapping 10-year averages from 1980 to 2007.[2] By using longer periods to average the data, we reduce the vulnerability of the results to the presence of outliers in the data. In addition, with this method of pooling observations, we address the time-variation in our data series. Taking the logarithm of discretionary fiscal policy volatility as the dependent variable, calculated in Section 2.1, we perform the following regression by Ordinary Least Squares (OLS) with panel-corrected standard errors:[3]

2 The first decade goes from 1980 to 1989, the second from 1990 to 1999, and the last decade uses the last 8 years in our data set.

3 The problem of sampling error, as the dependent variable is estimated rather than observed, could lead to higher standard deviations, thus reducing the overall quality of our results. To minimise this problem, we correct the standard errors of the panel by assuming that the disturbances of the variance-covariance estimates are heteroskedastic (each country has its own variance) and contemporaneously correlated across panels (each pair of countries has their own covariance).

$$log\left(\sigma_{i,t}^{\varepsilon}\right) = \propto_{i} + \beta_{i} FRI_{i,t} + \chi_{i} Delindex_{i,t} + \delta_{i} Pol_{i,t} + \phi_{i} Inst_{i,t} + \gamma_{i} M_{i,t} + \theta_{i,t} \quad (2)$$

where the Fiscal rule index (*FRI*) and the Delegation index (*Delindex*) are our proxies for the quality of institutions, which will be discussed in more detail in the next section. $Inst$ contains the proxy for political instability, the variable government crises, which counts the number of times in a year of any rapidly developing situation that threatens to bring the downfall of the present regime. Pol includes all the political variables that shape budget outcomes, namely the nature of the electoral system (assumes the value of 1 for governments elected by proportional representation and 0 by majoritarian circles); the number of parliamentary elections to capture the possible presence of a political budget cycle; an index of electoral competitiveness; and the Herfindahl index that measures the concentration of power in the parties.[4] The vector M comprises the following macroeconomic variables: the logarithm of GDP per capita to capture income effects; government size, measured as the ratio of government expenditure to GDP, to control for the stabilising role of fiscal policy; country size, measured as the logarithm of total population, and the dependency ratio to capture key social characteristics that affect policy volatility; openness, calculated as the merchandise trade-to-GDP ratio, to control for the degree of exposure of economies to external shocks; inflation to control for the occurrence of high inflation episodes; and three dummies, one for the run-up to EMU, another for countries constrained by the SGP, and the last one for new members of the EU, the Central and Eastern European Countries (CEEC).

2.3. Measuring the quality of institutions: the FRI and the Delegation index

In this article, the main focus is on the proxies for the quality of institutions, the FRI and the Delegation index. We are led to believe that countries with better and more developed institutions, with more check and balances, face more difficulties to change fiscal policy for reasons not related to the current state of the economy.

The FRI, which is taken from Debrun *et al*. (2008), is restricted to fiscal rules that fix targets or ceilings to budgetary aggregates expressed in numerical terms. The final objective is to cover all numerical fiscal rules in force that somehow restrain the conduct of fiscal policy, and to measure their relative strength (degree of effectiveness). This index, in contrast to most papers in this area of research, such as Alesina and Bayoumi (1996), Fatás and Mihov (2003, 2006), Furceri and Poplawski (2008), and Afonso *et al*. (2010), may vary over time and not only across countries.[5] Debrun *et al*. (2008), and Afonso and Hauptmeier (2009), have found statistically significant positive effects of this index on budget outcomes. In this context, we expect that the FRI may also work as a means to diminish discretionary fiscal policy volatility.

As for the Delegation index, it focuses on implicit constraints underlying the three phases of the budget process: (i) the $Preparation\ stage$, in which the budget draft is elaborated; (ii) the $Approval\ stage$, in which the budget draft is reviewed, approved and then formalised; and (iii) the $Implementation\ stage$, where the budget is implemented and which may be subjected to modifications or amendments. Hallerberg *et al*. (2007) built an indicator of fiscal governance based on these stages, finding strong evidence for a direct relationship between the institutional setup and fiscal discipline. The construction of our index of Delegation relies on the works of the previous paper and on Fabrizio and Mody (2008). The list of items and institutional scores that make up the index can be found in Table 7 of the appendix. As we consider that individual institutional features are perfect substitutes, we add up all items assuming equal weights to the aggregation process:

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4 It is given by the sum of the squared seat shares of all parties in the parliament:

$$Herfindahl\,index = \sum_{i=1}^{N}\left(\frac{No.\ of\ seats\ of\ party_{i}}{Total\ seats}\right)^{2},\quad 0 \le Herf.index \le 1 \quad (3)$$

5 See Appendix 1 in Debrun *et al.* (2008) for more details.

$$Preparation\,index = \frac{1}{3}\sum_{i=1}^{3} x_i \qquad \chi_i = \text{items 1 to 3 of Table 7} \tag{4}$$

$$Approval\,index = \frac{1}{3}\sum_{i=1}^{3} x_i \qquad \chi_i = \text{items 4 to 6 of Table 7} \tag{5}$$

$$Implementation\,index = \frac{1}{4}\sum_{i=1}^{4} x_i \qquad \chi_i = \text{items 7 to 10 of Table 7} \tag{6}$$

Taking the simple average of the sum of each institutional phase, we obtain:

$$Delegation\,index = \frac{Prepar.\ index + Approv.\ index + Implem.\ index}{3} \tag{7}$$

Table 1 summarises the data on the quality of institutions for each country and decade, after being normalised to zero mean and standard deviation equal to one. Two analyses emerge. First, a country with high numerical fiscal rules does not necessarily have tighter controls over the budget process (i.e. higher Delegation index). In fact, although the simple correlation between the FRI and the Delegation index is positive, it is not statistically significant at 5 per cent. For example, Denmark and Finland in the 2000s have low levels of the Delegation index but high values of the FRI, while Ireland and Greece are good examples of the opposite case. Second, over the last decade, there has been a broad-based increase in the quality of institutions.

Table 1

EVOLUTION OF THE QUALITY OF INSTITUTIONS BY COUNTRY AND DECADE

	1980s	1990s		2000s		Δ(2000s -1990s)	
	Delegation index	FRI	Delegation index	FRI	Delegation index	FRI	Delegation index
Austria	-1.0	-0.8	-0.3	0.4	0.6	1.2	0.9
Belgium	-1.4	0.8	-0.5	0.6	0.3	-0.2	0.8
Czech Republic	-	-	-	0.1	0.2	-	-
Denmark	0.6	0.7	0.1	2.0	-0.1	1.2	-0.2
Estonia	-	0.9	0.8	1.6	1.2	0.8	0.4
Finland	-0.5	-0.1	-0.4	1.5	-0.1	1.6	0.3
France	2.2	-0.3	2.2	0.2	1.6	0.6	-0.6
Germany	0.2	1.1	0.2	1.1	0.2	0.0	0.0
Greece	-1.4	-0.9	-1.0	-0.9	1.0	0.0	2.0
Hungary	-	-0.7	-1.8	-0.5	-1.8	0.2	0.0
Ireland	-0.5	-0.9	-0.5	-0.7	1.1	0.2	1.7
Italy	-2.2	-0.9	-1.0	-0.1	0.3	0.8	1.3
Latvia	-	-0.4	0.5	-0.4	0.5	0.0	0.0
Lithuania	-	-0.2	0.1	0.3	-0.1	0.5	-0.2
Luxembourg	0.4	-0.3	1.0	1.6	1.6	1.9	0.7
Netherlands	-0.5	0.7	-0.3	1.7	-0.1	1.0	0.3
Poland	-	-0.2	-0.4	1.3	0.5	1.5	0.9
Portugal	-0.4	-0.9	-0.5	-0.6	-0.8	0.2	-0.3
Slovakia	-	-0.9	-1.7	-0.1	-1.7	0.7	0.0
Slovenia	-	-	-	0.5	-0.3	-	-
Spain	-2.0	-0.1	-0.5	0.9	-0.1	1.0	0.5
Sweden	-0.5	-0.4	-0.3	1.6	1.2	2.1	1.5
United Kingdom	0.8	0.1	1.3	2.3	1.9	2.2	0.6
Correlation		0.381		0.359			

Source: Hallerberg *et al.* (2007), Debrun *et al.* (2008), Fabrizio and Mody (2008), and author's calculations.

3. Baseline results

3.1. Does the quality of institutions matter to reduce fiscal policy volatility?

In this section, we try to answer the above question by estimating Equation (2), considering primary expenditure as the public spending measure in Equation (1). In Table 2 we focus on the factors that influence policy volatility, giving special attention to our index of Delegation and to the FRI. In column (1), a one-standard deviation increase in the Delegation index and in the FRI would decrease policy volatility by about 8.9 and 10.0 per cent, respectively.[6] This result suggests that the quality of institutions, i.e. more checks and balances faced by politicians, prevent them from using fiscal policy for reasons not related to the current state of the economy.

In column (2), we assess the role played by the political variables. Our results imply that countries with proportional systems have more volatility of discretionary fiscal policy compared to majoritarian systems. The concentration of parliamentary seats in a few parties (the Herfindahl index) would also induce an increase in policy volatility, though it is not statistically significant. Regarding the variable elections, an extensive strand of literature has tested whether governments nearing an election choose to loosen fiscal discipline, engaging in excessive spending or/and cuts in taxes to ensure future re-election, therefore creating more policy volatility. For instance, Hallerberg *et al*. (2007), and Afonso and Hauptmeier (2009) claim that there is evidence of a political budget cycle. In contrast with the previous views, we find a negative sign of elections on policy volatility, which corroborates the findings of Fatás and Mihov (2003) that elections hold politicians accountable. Nonetheless, this result should be interpreted with due care as it is not statistically different from zero at conventional levels. In turn, in column (3) we add one variable that captures political instability, with its coefficient suggesting that higher political instability does not lead to higher public spending volatility.

Including the macroeconomic and other control variables (column (4)) strongly increases the fit of regression (R-squared of 0.439) suggesting that these variables account for a large portion of the variability in policy volatility, while the Delegation index and the FRI are still highly robust to these different specifications. GDP per capita has a negative coefficient, as expected, since according to Fatás and Mihov (2003), it is likely that poorer countries have a more volatile business cycle due to less developed financial markets, and at the same time, may resort more often to discretionary fiscal policy. As regards government size, policy volatility drops as the ratio of primary expenditure increases. This confirms the results of Afonso *et al.* (2010), who demonstrate that bigger governments have more stable government spending and automatic stabilisers are larger, inducing lower volatility of discretionary spending.

Another variable that has been popular in explaining the volatility of fiscal policy is country size (population of a given country). Smaller countries tend to use more discretion in fiscal policy, as documented by Furceri and Poplawski (2008). They argue that the negative relationship between the size of nations and government spending volatility can be explained by two reasons: first, smaller countries, which are more exposed to idiosyncratic shocks and have more output volatility, use fiscal policy more aggressively; second, larger countries have more scope to spread the government spending financing over a larger pool of taxpayers (increasing returns to scale), allowing governments to provide public goods in a less volatile way. The findings on country size are corroborated by our results (and also by Afonso *et al*. (2010)).

Regarding the last three dummy variables, estimates suggest that all of them are associated with lower levels of policy volatility. The interpretation over the sign of the run-up to EMU and the SGP dummy is

6 This is the usual interpretation of the coefficients since both indexes were normalised to have zero mean and standard deviation equal to one. The coefficients' quantitative impact on policy volatility is more accurate if we take the exponential of each coefficient. For instance, the semi-elasticity of policy volatility with respect to the FRI is 10.0 per cent (exp(-0.105)-1).

consensual as those stages have required significant improvements in public finances, lowering therefore policy volatility. In contrast, the explanation for the new members (CEEC) dummy lies on the fact that data for most of the new members are only available for the last decade (Chart 1), conditioning the analysis to only one observation per country. This period of time was indeed marked by major improvements in public finances in order to meet requirements for joining the EU, which led the CEEC to post low values of discretion.

Adding all the variables together allows us to corroborate the previous findings concerning the indexes for the quality of institutions, which point towards a sizeable negative impact on policy volatility; the marginal impact of the FRI and of the Delegation index on public spending volatility is around -11.3 and -16.2 per cent, respectively (column (5)). Taking the two indexes together, there is a strong indication that countries which stand at a one-standard deviation above the average in both indexes have on average 27.5 per cent less volatility in the discretionary component of fiscal policy. It is a striking result: better and more stringent restrictions imposed on the conduct of fiscal policy help mitigate the negative impact of policy volatility on the economy. For instance, if Portugal improved the quality of its institutions, by increasing both indexes (FRI and Delegation index) by one-standard deviation, and considering that the average value for the last decade reflects its current policy volatility, it would reduce policy volatility from 2.5 to 1.8 (reaching values slightly above Sweden but below those of Spain).

Table 2

DELEGATION AND FISCAL RULE INDEXES AND DISCRETIONARY FISCAL POLICY |
DEPENDENT VARIABLE: VOLATILITY OF DISCRETIONARY FISCAL POLICY

	(1)	(2)	(3)	(4)	(5)
Fiscal rule index	-0.105***	-0.072***	-0.116***	-0.152***	-0.120***
	(0.025)	(0.023)	(0.022)	(0.021)	(0.009)
Delegation index	-0.093*	-0.046*	-0.098*	-0.195***	-0.117***
	(0.051)	(0.026)	(0.055)	(0.025)	(0.057)
Electoral system		0.513***			0.180
		(0.139)			(0.246)
Elections		-1.738			-1.342
		(1.129)			(1.354)
Herfindahl index		1.077			0.738***
		(0.679)			(0.173)
Elec. competitiveness		-0.002			0.033
		(0.033)			(0.040)
Government crises			-0.242*		-0.153
			(0.138)		(0.214)
GDP per capita				-0.064	-0.210
				(0.256)	(0.307)
Government size				-0.032***	-0.025***
				(0.009)	(0.008)
Country size				-0.138***	-0.130***
				(0.035)	(0.011)
Dependency ratio				-0.004	-0.011
				(0.008)	(0.008)
Openness				0.000	0.001
				(0.002)	(0.002)
Inflation				-0.001	0.004
				(0.026)	(0.023)
Run-up to EMU				-1.507***	-1.544***
				(0.113)	(0.125)
SGP dummy				-0.470***	-0.486***
				(0.131)	(0.110)
New members				-1.083***	-1.177***
				(0.154)	(0.210)
Number of observations	41	41	41	41	41
Number of countries	23	23	23	23	23
R-squared	0.084	0.165	0.098	0.439	0.462

Source: Author's calculations.

Notes: OLS estimates with panel-corrected standard errors taking 10-year averages. Standard errors are shown in parentheses. Asterisks, *, **, ***, denote, respectively, statistical significance at the 10, 5 and 1% levels. Constant terms are not reported. Policy volatility was obtained from the logarithm of the standard deviation of residuals of Equation (1), with the growth of real primary expenditure as dependent variable.

Looking at other variables, the macroeconomic controls that were significant in column (4) continue to be of crucial importance. For instance, a one-percentage point increase in government size would lower policy volatility by 2.5 per cent, all else being equal. The R-squared of 0.462, from 0.439 in the previous specification, suggests that the political variables and the proxy for political instability may not be so important to explain differences in levels of policy volatility between countries. Indeed, with the exception of the Herfindahl index, which becomes statistically significant - pointing to an increase in policy volatility of nearly 7.7 per cent for each additional tenth of a point index - none of these variables are significant. In particular, our results do not provide evidence for higher values of fiscal policy volatility in the presence of a greater number of elections. In Albuquerque (2011) we find that this *puzzle* of the insignificance of elections on policy outcomes is related to the fact that we are using periods of 10-year averages.

In Albuquerque (2011) we also run additional regressions to deal with some econometric issues, particularly those related with collinearity problems and reverse causality issues. Succinctly, when running regressions with the FRI and the Delegation index in the same equation collinearity problems could emerge in case they are highly correlated. In addition, the problem of reverse causality relates to the possibility that budget outcomes might influence the evolution of fiscal institutions, rather than the other way around. What we have done to deal with these potential problems was to run regressions where the Delegation index and the FRI were used separately as dependent variables - addressing collinearity problems - and to run regressions through the IV estimator by resorting to a set of variables as instruments for the quality of institutions - targeting reverse causality. All in all, we find that the results obtained are consistent with those of Table 2 (see Tables 5 and 6 of the appendix).

3.2. Using the sub-categories of the FRI and Delegation index

Another pertinent analysis would be to confirm if the previous results remain valid and robust when we proceed to disaggregate the indexes for the quality of institutions into sub-categories. The Delegation index is subdivided into the Preparation, Implementation and Approval stages; and the FRI is split into two indexes, one that captures all the expenditure rules in force in the EU member states, the expenditure rule index (ERI), and the other that deals with budget balance and debt rules (BBDRI).

Beginning with the Delegation index sub-components, the most interesting finding relates to the fact that, among all the stages through which the budget draft is prepared, approved and implemented, only the Approval index seems to consistently have explanatory power for reducing policy volatility (Table 3).[7] When we include all the relevant control variables (column (5)), a one-standard deviation increase in the Approval index points to a negative impact of around 13.7 per cent on the volatility of fiscal policy.

Against this background, policy-makers should arguably aim for a strong Approval index. That is, firstly, the executive should be vested with strong agenda-setting powers in order to be protected against significant parliamentary amendments to the initial proposal of the budget, which would create excessive volatility in the conduct of fiscal policy. Secondly, the possibility that parliament is dissolved if it fails to approve the budget in due time would increase the political costs associated to such a fall of government, which would lead to more consensus on the initial budget proposal. And finally, the sequence of votes also matters to reduce policy volatility, i.e. the order of decision-making during the parliamentary budget deliberation should be focused first on defining the limits over total revenue, expenditure and deficit before the work on the details of the budget starts.

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7 Nonetheless, this does not mean that the preparation and implementation stages should be left out from the design of an optimal institutional framework for fiscal policy. In fact, the three variables could be highly correlated with each other, and the Approval index may be capturing the effects of the other two indexes on policy volatility, which ultimately would produce misleading results. We have tested if there was any statistical significant correlation between each one of these three variables, and the results, however, only pointed to a significant correlation between the Preparation index and Approval index of about 0.5.

Moving to the sub-categories of the FRI, our overall assessment is that considering the index of numerical fiscal rules as a whole or taking each sub-component individually leads to qualitatively equal results. Column (5) tells us that a one-standard deviation increase in the ERI and in the BBDRI, other things being equal, would reduce policy volatility by about 9.2 and 12.5 per cent, respectively.

Table 3

SUB-INDEXES AND DISCRETIONARY FISCAL POLICY | DEPENDENT VARIABLE: VOLATILITY OF DISCRETIONARY FISCAL POLICY

	(1)	(2)	(3)	(4)	(5)
Expenditure rule index	-0.011	0.013	-0.021	-0.088**	-0.097***
	(0.036)	(0.048)	(0.028)	(0.043)	(0.037)
B.B. and debt rules index	-0.081***	-0.058	-0.092***	-0.139***	-0.133***
	(0.025)	(0.065)	(0.027)	(0.043)	(0.084)
Preparation index	-0.104	-0.092	-0.098	-0.162	-0.172
	(0.120)	(0.169)	(0.117)	(0.113)	(0.174)
Approval index	-0.128***	-0.129***	-0.136***	-0.144***	-0.147***
	(0.020)	(0.019)	(0.025)	(0.051)	(0.044)
Implementation index	0.083**	0.076***	0.081	0.078	0.088
	(0.039)	(0.028)	(0.050)	(0.059)	(0.059)
Herfindahl index		1.141*			0.323
		(0.664)			(0.492)
Government size				-0.023***	-0.018
				(0.009)	(0.013)
Country size				-0.051	-0.034
				(0.058)	(0.023)
Run-up to EMU				-1.911***	-2.015***
				(0.292)	(0.346)
SGP dummy				-0.559***	-0.593***
				(0.165)	(0.138)
New members				-1.430***	-1.579***
				(0.278)	(0.462)
Number of observations	41	41	41	41	41
Number of countries	23	23	23	23	23
R-squared	0.168	0.229	0.184	0.490	0.520

Source: Author's calculations.

Notes: OLS estimates with panel-corrected standard errors taking 10-year averages. Standard errors are shown in parentheses. Asterisks, *, **, ***, denote, respectively, statistical significance at the 10, 5 and 1% levels. Constant terms are not reported, and other explanatory variables, which are included in Table 2, are also not reported due to space limitation. Policy volatility was obtained from the logarithm of the standard deviation of residuals of Equation (1), with the growth of real primary expenditure as dependent variable.

4. Robustness results

In this section, we conduct some robustness analysis to check if the remarks inferred from our baseline estimates could be extended in two ways: (i) using a different measure of public spending in Equation (1); and (ii) using another specification for the fiscal reaction function to derive our measure of discretionary fiscal policy volatility.

Firstly, we replace real primary expenditure by real consumption expenditure in Equation (1) as the proxy for public spending. We want to test if a narrower measure of fiscal policy, which has been widely used in most of the papers when using a large sample of countries, does still corroborate our findings. Re-estimating different specifications of columns (5) of the previous tables (Table 2 and Table 3), we obtain columns (1) and (2) of Table 4. Overall, the results seem a little disappointing as policy volatility generally appears not to be statistically affected by the quality of institutions (the first seven explanatory variables). In contrast, government size and country size continue to be statistically significant and associated with lower levels of policy volatility. The findings about fiscal institutions not being important for public consumption volatility can be associated with the fact that we are dealing with a less comprehensive measure of fiscal policy, leaving out important items of government expenditure, such as gross fixed capital formation (GFCF), subsidies and social benefits other than transfers in kind, other current transfers and capital transfers, which might not be capturing all discretionary measures undertaken by governments.

In order to prove that it is in fact the exclusion of most of those items from the government spending measure that is influencing our results, we use the largest component of primary expenditure, which is not included in public consumption. This component is social transfers, which account, on average, for around 36 per cent of primary expenditure in our sample of countries for the 2000-2007 period. Using the same methodology as before, we obtain a new measure of policy volatility by applying the growth of real social transfers as the dependent variable in Equation (1). The new estimates confirm our initial suspicion that the volatility of social transfers is highly sensitive to the quality of institutions (columns (3)-(4) of Table 4). In fact, these regressions yield the same qualitative results as those from Table 2 and Table 3. In this context, our baseline results from Section 3, where primary expenditure was used in the first-stage regression, seem to be driven mainly by social transfers.

Secondly, we provide another way of computing the measure of discretionary fiscal policy through a typical fiscal policy reaction function, where government spending reacts to cyclical fluctuations, past developments in public debt, and to its own past values:

$$G_{i,t} = \propto_i + \beta_i Gap_{i,t} + \gamma_i D_{i,t-1} + \delta_i G_{i,t-1} + \omega_{i,t} \quad (8)$$

where the country-specific volatility of the error term (σ_i^{ω}) is again interpreted as the typical size of a discretionary change in fiscal policy for country i. G is the cyclically adjusted primary expenditure (CAPE), Gap is the output gap measured as the difference between actual and potential output, whereas D is gross government debt. All variables are expressed in percentage of potential output, computed according to the production function method. To avoid the possibility of endogeneity bias, we instrument for the output gap using two lags of the own output gap, lagged inflation and the logarithm of oil spot price.

Similarly to what was done before, we take the logarithm of the standard deviation of the residuals as our measure of the volatility of discretionary fiscal policy. Overall, the results of columns (5) and (6) of Table 4 confirm that fiscal institutions play a key role in reducing fiscal policy volatility. But, while fiscal rules variables exhibit a strong, statistically significant negative impact on policy volatility, the results for fiscal governance variables are weaker as only the Preparation stage has the expected negative sign.

Summing up, we have shown that our baseline conclusions are less clear-cut when we use public consumption, instead of primary expenditure, as the proxy for public spending. What we argue, however, is that it is primary expenditure, the most comprehensive measure, that should be used when measuring all discretionary policy measures carried out by governments. Using this broader measure, which includes, *inter alia*, social transfers, one would find that fiscal institutions do matter to reduce fiscal policy volatility in Europe.

Table 4

ROBUSTNESS RESULTS | DEPENDENT VARIABLE: VOLATILITY OF DISCRETIONARY FISCAL POLICY

	Consumption expenditure		Social transfers		CAPE	
	(1)	(2)	(3)	(4)	(5)	(6)
Fiscal rule index	-0.157		-0.057**		-0.175***	
	(0.205)		(0.027)		(0.061)	
Expenditure rules index		0.104		0.172*		-0.110***
		(0.114)		(0.102)		(0.004)
B.B. and debt rules index		-0.240*		-0.546***		-0.086***
		(0.135)		(0.046)		(0.022)
Delegation index	-0.107		-0.180***		0.063	
	(0.202)		(0.042)		(0.079)	
Preparation index		-0.018		-0.343**		-0.326**
		(0.260)		(0.142)		(0.158)
Approval index		-0.094		-0.079		0.081**
		(0.084)		(0.117)		(0.032)
Implementation index		0.010		0.379***		0.367***
		(0.123)		(0.078)		(0.068)
Herfindahl index	-0.516	-0.656	-2.755***	-3.120***	-0.078	0.232
	(1.852)	(2.034)	(1.029)	(0.710)	(0.142)	(0.172)
Government size	-0.039***	-0.046**	-0.044***	-0.048***	0.005	0.032***
	(0.013)	(0.022)	(0.003)	(0.019)	(0.023)	(0.009)
Country size	-0.190**	-0.181*	-0.293***	-0.050	-0.035**	0.076***
	(0.075)	(0.105)	(0.037)	(0.065)	(0.017)	(0.022)
Run-up to EMU	0.401	0.419	-0.996**	-1.389***	-0.996***	-1.926***
	(0.492)	(0.350)	(0.389)	(0.264)	(0.365)	(0.180)
SGP dummy	0.288***	0.275**	-0.200	-0.585***	-0.100	-0.178**
	(0.111)	(0.119)	(0.171)	(0.108)	(0.166)	(0.078)
New members	0.380	0.446	-1.601*	-2.049***	-0.377	-1.394***
	(1.382)	(1.273)	(0.854)	(0.528)	(0.423)	(0.166)
Number of observations	44	44	42	42	38	38
Number of countries	23	23	23	23	23	23
R-squared	0.716	0.738	0.691	0.789	0.340	0.611

Source: Author's calculations.

Notes: OLS estimates with panel-corrected standard errors taking 10-year averages. Standard errors are shown in parentheses. Asterisks, *, **, ***, denote, respectively, statistical significance at the 10, 5 and 1% levels. Constant terms are not reported, and some explanatory variables are also not reported due to space limitation. Policy volatility was obtained from the logarithm of the standard deviation of residuals of Equation (1) for columns (1)-(4), and from Equation (8) for columns (5)-(6). The dependent variables used in the first-stage regressions were as follows. Columns (1)-(2): the growth of real consumption expenditure; Columns (3)-(4): the growth of real social transfers; Columns (5)-(6): the ratio of CAPE to potential GDP.

5. Concluding remarks

This work provides evidence for a sizeable, statistically significant negative impact of the quality of institutions on public spending volatility in the EU countries. It is probably the case that countries with more checks and balances make it more difficult for governments to change fiscal policy for reasons unrelated to the current state of the economy. This finding reinforces the need for a well-defined and appropriate institutional design of fiscal rules and of budgetary procedures.

Our results also confirm the findings of Furceri and Poplawski (2008), who state that bigger countries have in general less government spending volatility, as they resort less to government spending for fine-tuning purposes and as governments from big countries could provide public goods in a less volatile way. Our estimates provide further evidence about the stabilising function that bigger governments exert, since countries with large public sectors as a percentage of GDP have more stable government spending and automatic stabilisers are larger, inducing lower volatility of discretionary spending.

What appears to be a surprise, and in fact contrasts with results elsewhere, relates to the insignificance of most of the political factors. In fact, with the exception of the Herfindahl index which suggests that high concentration of parliamentary seats in a few parties would increase public spending volatility, none of the political variables turn out to be statistically significant. These findings may be related to the fact that we are dealing with the EU countries that have more political similarities than one would initially suspect. In general, the run-up to EMU and the SGP dummies have the expected sign, pointing to lower levels of policy volatility. In addition, the results for most of the new EU members also point to reduced levels of policy volatility, reflecting recent improvements in public finances in order to meet the requirements for joining the EU.

Our analysis is nevertheless somewhat conditioned by the fact that the results are sensitive to the choice on the measure used for public spending. If we chose public consumption, a narrower measure of public expenditure, instead of primary expenditure (used in the baseline), none of the variables measuring the quality of institutions would be significant. This is an interesting result, shedding some light on the possible caveats of previous studies (Fatás and Mihov (2003), and Afonso *et al*. (2010)), where public consumption has been used as the measure of public spending. In fact, our results imply that a more comprehensive measure of fiscal policy is able to better capture all discretionary measures undertaken by governments. More specifically, our estimates suggest that social transfers, one important item of primary expenditure that is not included in public consumption, is in fact driving the results. We believe that by using a broader measure for public spending, we have constructed a better measure of $discretion$, which we defined as government policy actions that do not represent reactions to changes in economic conditions and that may only reflect political preferences.

All in all, by studying the effects of explicit and implicit budgetary constraints on fiscal policy volatility, we contribute to the debate on improving and reaching an optimal institutional framework for fiscal policy. Although our results point to the strengthening of fiscal institutions, each case must be considered individually, taking into account the prevailing institutional and economic environment, and evaluating the advantages and disadvantages of the application of given constraints. In fact, there are some countries that are more exposed and vulnerable to external shocks and therefore it would be preferable to have more flexibility to respond to these shocks, minimising in that way the economic costs of restrictions and deliberately letting the volatility increase.

The current analysis offers several possibilities for further research. One could explore other data sets with respect to the proxy for the quality of institutions, for example concerning independent fiscal committees. One could also test, following Fatás and Mihov (2006), if the benefits stemming from the imposition of restrictions would outweigh the negative effects from the loss of flexibility to respond to output shocks. Another possible extension, in line with Fabrizio and Mody (2008), would be to identify what determines the existing institutional environment in EU countries.

Appendix

Table 5

DELEGATION INDEX AND DISCRETIONARY FISCAL POLICY |
DEPENDENT VARIABLE: VOLATILITY OF DISCRETIONARY FISCAL POLICY

	(1)	(2)	(3)	(4)	(5)	(6) IV
Delegation index	-0.132**	-0.033***	-0.157**	-0.202***	-0.199***	-0.388*
	(0.054)	(0.010)	(0.067)	(0.044)	(0.059)	(0.231)
Herfindahl index		2.066**			1.723**	0.995
		(0.967)			(0.867)	(1.397)
Government size				-0.034***	-0.028***	-0.031*
				(0.006)	(0.007)	(0.019)
Country size				-0.138***	-0.124***	-0.188**
				(0.046)	(0.025)	(0.080)
Number of observations	56	56	56	56	56	41
Number of countries	23	23	23	23	23	23
R-squared	0.063	0.181	0.078	0.372	0.418	0.415
OID test (p-value)						0.402

Table 6

FISCAL RULE INDEX AND DISCRETIONARY FISCAL POLICY |
DEPENDENT VARIABLE: VOLATILITY OF DISCRETIONARY FISCAL POLICY

	(1)	(2)	(3)	(4)	(5)	(6) IV
Fiscal rule index	-0.142***	-0.089***	-0.155***	-0.214***	-0.172***	-0.343*
	(0.031)	(0.023)	(0.035)	(0.022)	(0.032)	(0.185)
Herfindahl index		1.055			0.905***	-0.457
		(0.717)			(0.183)	(1.895)
Government size				-0.022***	-0.017**	-0.026*
				(0.008)	(0.007)	(0.017)
Country size				-0.138***	-0.095***	-0.042
				(0.026)	(0.023)	(0.097)
Number of observations	41	41	41	41	41	41
Number of countries	23	23	23	23	23	23
R-squared	0.060	0.161	0.072	0.383	0.431	0.400
OID test (p-value)						0.535

Source: Author's calculations.

Notes: OLS estimates with panel-corrected standard errors taking 10-year averages. Standard errors are shown in parentheses. Asterisks, *, **, ***, denote, respectively, statistical significance at the 10, 5 and 1% levels. Due to space limitation, only some variables are reported. The dependent variable is the same as in Table 2. In column 6 of Table 5, the Delegation index is instrumented by: a dummy for countries with delegation in the execution of their budget, a variable counting the number of times of cabinet changes, and six Worldwide Governance Indicators, namely voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption (see Kaufmann *et al.* (2009) for more details). In column 6 of Table 6, the instruments for the Fiscal rule index are the same, with the exception of a dummy for countries that rule their budget process mainly by commitment over fiscal contracts, which replaces the delegation dummy. The overidentifying restrictions test (OID) or Sargan test reports p-value from a test that the instruments are uncorrelated with the residuals.

Table 7

CODING SCHEME FOR EACH PHASE OF THE BUDGET PROCESS	
Preparation Stage	**Numerical Coding**
1. General constraint	
Spending and debt as share of GDP	4
Spending as share of GDP or golden rule or limit on public borrowing	3
Balance and debt as share of GDP	2
Balance as share of GDP	1
None	0
2. Agenda setting	
MF or PM determines budget parameters to be observed by spending ministers	4
MF proposes budget norms to be voted on by cabinet	3
Cabinet decides on budget norms first	2
MF or cabinet collects bids subject to the pre-agreed guidelines	1
MF or cabinet collects bids from spending ministers	0
3. Structure of negotiations	
Finance ministry holds bilateral negotiations with each spending ministry	4
Finance ministry holds multilateral negotiations	2
All cabinet members involved together	0
Approval Stage	
4. Parliamentary amendments of the budget	
Are not allowed, or required to be offsetting	4
Do not required to be offsetting	0
5. Relative power of the executive vis-à-vis the parliament; can cause fall of government?	
Yes	4
No	0
6. Sequence of votes	
Initial vote on total budget size or aggregates	4
Final vote on budget size or aggregates	0
Implementation Stage	
7. Procedure to react to a deterioration of the budget deficit due to unforeseen revenue shortfalls or expenditure increase	
MF can block expenditures	4
MF cannot block expenditures	2
8. Transfers of expenditures between chapters (i.e. ministries' budgets)	
Not allowed	4
Only possible within departments with MF consent	3.2
Only possible within departments	2.56
Require approval of parliament	1.92
Only if provided for in initial budget or with MF approval	1.28
Limited	0.64
Unlimited	0
9. Changes in the budget law during execution	
Only new budgetary law to be passed under the same regulations as the ordinary budget	4
Requires parliament consent	2
At total or large discretion of government	0
10. Carryover of unused funds to next fiscal year	
Not permitted	4
Limited and required authorization by the MF or parliament	2.66
Limited	1.33
Unlimited	0

Source: Hallerberg *et al.* (2007) and Fabrizio and Mody (2008).

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WELFARE COSTS OF INFLATION WITH DISTORTIONARY TAXATION*

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ABSTRACT

We show that the welfare cost of inflation decreases when distortionary taxation is taken into account. The estimates of the welfare cost of inflation usually consider that governments are able to use lump sum taxation to finance their budget. However, governments can only use distortionary taxation, such as labor income taxes. When only distortionary taxation is available, the government can decrease the size of distortionary taxes by compensating the decrease in revenues with the revenues generated by inflation. We compare the case in which the government has access to lump sum taxes with the case in which only distortionary taxes are available. We keep the level of government expenditures as a percentage of output constant. We find that the welfare cost of an increase in inflation from 0 to 10% per year decreases from 1.3% in terms of income to 0.8%.

1. Introduction

The popular belief is that inflation is harmful, but in general its effects are not well understood. That is due to the fact that the effects of inflation are very diversified and many times subtle.

Inflation may have important distributional effects. Surprises in the inflation rate lead to redistributions of income and welfare between various groups of the population. Unexpected inflation increases redistribute wealth from lenders to borrowers , and unexpected reductions of inflation redistribute wealth in the opposite direction. This principle applies to other financial contracts besides the loan contracts. In general those that hold financial assets that are not fully indexed to inflation lose with unexpected increases in inflation and win with unexpected decreases. For instance an inflation higher than expected redistributes wealth to the younger generations, since the older generations have a higher portion of nominal assets. It also redistributes income from those that have fixed nominal income contracts to those that have variable incomes that follow inflation. Two examples: an inflation above what was expected implies for the pensioners a deterioration in their real pension and for workers a a deterioration in their real wage. A redistribution of income can occur between countries. When the exchange rate is fixed, a higher inflation rate in one country is going to make that country exports more expensive and affect that country trade account.

Moreover, a variable inflation rate makes it difficult to distinguish changes in the relative prices from changes in the aggregate price, which implies an efficiency loss in the allocation of the resources in the economy. For instance, assume that a firm expects low inflation and inflation turns up to be high. When

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* The views in this paper are those of the authors and do not necessarily reflect the views of the Banco de Portugal.

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the firm observes the price of the good it produces increasing more rapidly than expected, it might believe that there was an increase in the demand for its product. As it confuses the increase in inflation with an increase in the demand for its product it increases production. If this behavior is repeated by many firms there will be an increase in aggregate supply that leads to a distorted level of output in the economy.

Menu costs are another effect of inflation. This costs are associated with the resources spend by sellers to adjust to the inflation the prices of the goods and services they sell. The concept is associated with the image of restaurants incurring in costs of printing new menus with higher prices for the dishes as the price of the ingredients used increase.

Inflation has effects over the tax system. Inflation increases the effective marginal tax rates. If the marginal tax brackets are set in nominal terms, or are not fully indexed to inflation, the tax payers are pushed to higher marginal tax rates by the effect of inflation. Also, the effect of inflation over the depreciation allowed by the firms' tax code discourages productive investment. The value of the depreciation that firms can take depends on the historical value of its physical capital, and with inflation the real value of the depreciation falls. A similar situation occurs with capital gains on assets. The tax on capital gains is taken on the difference between the sale price and the purchase price of the asset. If the purchase price considered is its historical value, then investors will be taxed on capital gains even when the real price of the asset is unchanged.

Inflation is a regressive tax. As the income elasticity of the demand for money is less than one, the richer taxpayers pay a smaller portion of their income as inflation tax than poorer taxpayers.

Inflation is a tax and as all taxes introduces distortions in the economy, implies smaller disposable income for the private agents and revenue for the government. Part of that income can be recovered by the private agents through more public services or less of the other taxes. However, as the agents in the economy are going to reduce their demand for money their are going to have more difficulty in carrying their transactions. Unlike the other costs referred above, this cost does not vanish when the economic agents are homogeneous or prices are fully flexible.

In this paper we quantify only this effect of inflation. Thus, the figure for the cost we compute is the lower bound of the total inflation cost. We consider that inflation is completely anticipated. We determine the real effects of inflation, when the agents' inflation expectations coincide with the realized inflation and increases in inflation have a zero impact on the government revenue. In this context the social welfare variation caused by an increase in inflation is known in the literature as the welfare cost of inflation.

The experiment that we have in mind is the one in which the government increases the amount of money 10 percent every period and gives back to the economic agents the revenue in excess of the necessary to finance government consumption. Additionally, all contracts can be adjusted to the rate of inflation and everyone knows the value of inflation. In this case, everyone incorporates the higher rate of inflation into their plans. House and apartment rentals, negotiated labor contracts, loan contracts, income tax brackets in the tax code, etc. will be adjusted upward by 10 percent every period. All decisions incorporate the price changes.

The literature concluded that this experiment imposes costs. The most important cost is the efficiency loss caused by the inflation tax. Inflation increases the opportunity cost of money, that is, the interest rate. As a result, people substitute away from activities that require cash, such as consumption, for activities that do not require cash, such as leisure. This result is associated with the assumption that revenues obtained from inflation (known as seigniorage) are redistributed back to the public in lump sum form. As lump sum taxes do not affect the opportunity cost of money, it is not possible to counteract the distortionary effect of inflation. It follows that anticipated inflation decreases welfare.

The computation of the welfare cost of inflation has been done for many countries and the results are analogous across them. The U.S. experience of the post-World War II is the one mostly studied. The first

approach to measure the welfare cost of inflation, introduced by Bailey (1956), was to compute the area under the money demand curve. In the first papers, Fischer (1981) and Lucas (1981), found the cost of inflation to be relatively low. Fischer (1981) computes the deadweight loss generated by an increase in anticipated inflation from zero to ten percent as 0.3 percent of GDP using the monetary base as the definition of money. Lucas (1981), conducting the same experiment, places the cost of a ten percent inflation at 0.45 percent of GDP using M1 as the measure of money.

Subsequently, general equilibrium models have been used as an alternative to econometric estimates of the triangle under an estimated money demand curve. Cooley and Hansen (1989) calibrated a cash-in--advance version of a business cycle model. They found that the welfare cost of ten per cent inflation was just below 0.4 per cent of GNP. Thus, the costs of inflation were along the same order of magnitude as suggested in previous studies. More recently, models with variable money velocity have been used. Lucas (1994) and Pakko (1998) discussed the welfare costs of inflation in the context of a shopping time model of money demand and estimated the costs of a ten percent inflation to be about 1.3 percent of the output. Burstein and Hellwig (2008) considered a model with money in the utility function and obtained values similar to the ones found in the shopping time models of money. Silva (2012) adopts a more fundamental approach. When the timing for the portfolio decisions is taken as exogenous, in which case money velocity is constant, the welfare cost of ten percent inflation instead of zero inflation is 0.4 percent of the output, as in Cooley and Hansen. On the other hand, with endogenous timing for the portfolio decisions, money velocity is variable and the welfare cost of ten percent inflation instead of zero inflation increases to 1.3 percent of the output.

However, there are two features of real economies that these models ignore: government consumption and distortionary taxation. These features could be important in assessing the welfare benefits of bringing down inflation because government consumption is a large component of aggregate spending and because lump sum taxation is usually not part of the available fiscal instruments. The welfare cost estimates above ignore the interaction of the inflation tax with other distortionary taxes. We analyse this issue here.

The further apart are the marginal rate of substitution between consumption and leisure and the marginal rate of transformation, the greater the degree of inefficiency in the economy. Inflation introduces a wedge between two fundamental marginal rates: the marginal rate of substitution and the marginal rate of transformation. With lump sum taxation, the percentage change in the wedge is equal to the percentage change in the inflation rate. With distortionary taxation, the wedge depends on the inflation rate and on the tax rate over consumption and labor. Moreover, the wedge increases if the inflation rate or the tax rate increase.

If the fiscal instrument available is a distortionary consumption tax, instead of lump sum taxation, then an increase in inflation allows for a decrease in the distortionary consumption tax. Therefore, in comparison with the case in which lump sum taxation is available, the impact over the wedge is smaller, since the distortionary tax rate and the inflation rate move in opposite directions. This paper confirms this intuition. The welfare costs of inflation are smaller when lump sum taxation is not available.

We consider an endogenous general equilibrium Baumol-Tobin model to quantify the welfare benefits of a reduction in anticipated inflation. The model is similar to the one described in Silva (2012). There is a cash in advance constraint for consumption expenditures, but the timing of the financial transactions is endogenous. Typically, models to tackle this question with variable money velocity have been ad hoc models, with assumptions on shopping time or money in the utility function. Generally, it is assumed that lump sum taxes are available. Instead, we consider the more realistic case, that the only fiscal instruments are distortionary taxes.

The results confirm the intuition. The welfare cost of ten percent instead of zero inflation decreases from 1.3 percent of income with lump sum taxation to 0.8 percent with distortionary taxation. Eighty basis

points of the USA income is 80 billion dollars in 2000 dollars, which is a substantial figure.

The paper is organized as follows. Section 2 presents an example to focus on the intuition of the result. Section 3 specifies the model. Section 4 explains how the steady state equilibrium is determined. Section 5 has the main result: the effect of an increase in inflation. Section 6 concludes.

2. Example

The economy has a representative household with preferences over consumption c and labor h,

$$u(c,h) = \log c + \alpha \log\left(1-h\right),$$

where $\alpha > 0$ is a parameter. As discussed in King et al. (1988), these preferences are compatible with a balanced growth path. There is a cash in advance constraint that requires that consumption expenditures to be done with money

$$c \leq m.$$

Production is linear in labor,

$$y = Ah,$$

where $A > 0$ is a parameter. Firms pay a wage w equal to the marginal productivity of labor,

$$w = A.$$

The government satisfies its budget constraint

$$rm + \tau wh + T = g,$$

where r is the nominal interest rate, m is real money holdings, τ is the tax rate on labor income, T is the lump sum tax and g is government consumption. Market clearing implies that the production of the good is equal to its demand,

$$y = g + c.$$

Utility maximization by the household implies equality of the marginal rate of substitution between leisure and consumption, and the real wage, taking into account taxes and the interest foregone of money,

$$\frac{\alpha c}{1-h} = \frac{w\left(1-\tau\right)}{1+r}.$$

The Ramsey problem for this economy is to maximize the representative household's utility subject to the government financing condition, the production function constraint and the condition that the ratio between the marginal rate of substitution and the marginal rate of transformation is equal to the distortion caused by the policy instruments. This problem can be formalized as

$$\max\left\{\log c + \alpha \log\left(1-h\right)\right\}$$

subject to

$$\begin{aligned} rc + \tau Ah + T &= g, \\ Ah &= g + c, \\ \frac{\alpha c}{\frac{1-h}{A}} &= \frac{1-\tau}{1+r}. \end{aligned}$$

We consider two cases with different policy instruments available. In the first case, the available instruments are the labor income tax and the interest rate. In the second case, the available instruments are a lump sum tax and the interest rate.

In the first case, with $T = 0$, using the first two restrictions of the Ramsey problem we get $\frac{c}{Ah} = \frac{1-\tau}{1+r}$. Using this equality and the third restriction of the Ramsey problem we obtain $h = \frac{1}{1+\alpha}$. And using the production function we get $c = \frac{A}{1+\alpha} - g$. Without loss of generality, we set $\alpha = 2$, $A = 3/2$, and $g = 0.2$. The solution for the allocation vector (c,h) is $\left(0.3, 1/3\right)$. Replacing in the third restriction of the Ramsey problem we get the value for the distortion, $\frac{1-\tau}{1+r} = 0.6$. There are many combinations of r and τ that imply $g = 0.2$ and $\frac{1-\tau}{1+r} = 0.6$, and so the same welfare. Three examples: (i) $r = 0$ and $\tau = 0.4$; or (ii) $r = 2/3$ and $\tau = 0$; or (iii) $r = 0.1$ and $\tau = 0.34$.

In the second case, with $\tau = 0$ and lump sum taxes, the solution to the Ramsey problem is not to have any distortion. In other words, the optimal allocation is achieved by setting $r = 0$ and $T = 0.2$. The Friedman rule applies (Friedman 1969). Any other pair $\left(\tau, r\right)$ that satisfies the restrictions in the Ramsey problem is associated with a lower utility level.

Two conclusions can be reached from the analysis above. First, when lump-sum taxes are not part of the policy instruments available, changing the nominal interest rate does not have any welfare effects since the labor income tax rate can be adjusted accordingly. Second, when the labor income tax rate is not available, increasing the nominal interest rate implies a decrease in the lump sum tax and a decrease in welfare. In this case with 0% interest rate there is no distortion between the marginal rate of substitution and the marginal rate of transformation, but with a 10% interest rate, the distortion between the two margins is equal to $\frac{1}{1.1}$.

3. The Model

We use the general equilibrium Baumol-Tobin model of Silva (2012). Money must be used to purchase goods, only bonds receive interest payments, and there is a cost to transfer the money from bond sales to the goods market. As a result, households accumulate bonds for a certain time and exchange bonds for money infrequently. The infrequent sales of bonds for money occur as in the models of Grossman and Weiss (1983), Rotemberg (1984) and, more recently, Alvarez, Atkeson, and Edmond (2009). The difference is that the timing of the financial transfers is endogenous. We allow for distortionary taxes and inflation tax to finance government consumption.

Time is continuous and denoted by $t \in [0,\infty)$. At any moment, there are markets for assets, consumption goods, and labor. There are two assets: money and nominal bonds. The markets for assets and the market for goods are physically separated.

There is an unit mass of infinitely-lived households with preferences over consumption and leisure. Households have two financial accounts, a brokerage account, in which they hold bonds, and a bank account, in which they hold money. We assume that readjustments in the brokerage account have a fixed cost. As only money can be used to buy goods, households need to maintain an inventory of money in their bank account large enough to pay for consumption expenditures until the next transfer of funds.

Firms are perfect competitors and hire labor and capital to produce the consumption good. There is a government, which must finance its expenditures with labor income taxes or seigniorage.

3.1. Firms

At date t, the firms combine labor H_t and capital K_t to produce goods of date t. The production function is Cobb-Douglas,

$$y_t = AK_t^{\theta} H_t^{1-\theta}, \tag{1}$$

where y_t is output, A is a technological parameter, and θ is a parameter, $0 < \theta < 1$.

Firms maximize profits, which are given by

$$P_t A K_t^{\theta} H_t^{1-\theta} - W_t H_t - r_t^k P_t K_t,$$

where P_t is the price of the good, W_t is the nominal wage received by the worker, and r_t^k is the real rental price of capital. As firms are perfect competitors, profit maximization implies demand for labor

$$\frac{W_t}{P_t} H_t = \left(1-\theta\right) y_t, \tag{2}$$

and demand for capital

$$r_t^k K_t = \theta y_t. \tag{3}$$

3.2. Government

The government finances consumption expenditures g_t with taxes on labor income at rate τ and seigniorage $r_t m_t$, where r_t is the nominal interest rate and m_t real money holdings.[1] The budget constraint of the government is

$$r_t m_t + \tau\left(1-\theta\right) y_t = g_t. \tag{4}$$

3.3. Households

As referred above each household has a brokerage account and a bank account. The funds deposited into the brokerage account cannot be used to buy goods but receive nominal interest r_t. Only the money in the bank account can be used to buy goods. The transfer of funds between accounts, as said before, has a real fixed cost γ.

Household i sells hours of labor $h_t\left(i\right)$ to the firms and rents capital $k_t\left(i\right)$ to the firms. The labor income is then $W_t\left(1-\tau\right)h_t\left(i\right)$ and the rental income is $r_t^k P_t K_t$. Labor income and capital income are deposited into the brokerage account. The instantaneous utility function of household i is

$$u(c_t\left(i\right), h_t\left(i\right)) = \frac{\left[c_t\left(i\right)\left(1-h_t\left(i\right)\right)^{\alpha}\right]^{1-1/\eta}}{1-1/\eta},$$

where $1/\eta$ is the relative risk aversion, and α the relative preference parameter for leisure $l_t \equiv \left(1-h_t\right)$. These preferences are compatible with a balanced growth path (King et al. 1988). Household i decides consumption $c_t(i)$, labor supply $h_t(i)$, capital $k_t(i)$, the dates when transfers between accounts are made $T_j\left(i\right)$, $j = 1,2,\ldots$, money holdings in the bank account $M_t(i)$, and bond holdings in the brokerage account $B_t(i)$ so that these allocations solve the problem

1 We do not consider capital income taxes because, in this economy, it is optimal not to tax capital.

$$\max \sum_{j=0}^{\infty} \int_{T_j}^{T_{j+1}} e^{-\rho t} \frac{\left[c_t(i)\left(1-h_t(i)\right)^{\alpha} \right]^{1-1/\eta}}{1-1/\eta} dt$$

subject to the intertemporal budget constraint

$$\sum_{j=1}^{\infty} Q_{T_j(i)} \left[M^{+}_{T_j(i)}(i) + P_{T_j(i)} \gamma \right] \leq B_0(i) + P_0 k_0(i) + \int_0^{\infty} (1-\tau) W_t h_t(i)\, dt,$$

and to the cash in advance constraint

$$M^{+}_{T_j(i)}(i) = \int_{T_j(i)}^{T_{j+1}(i)} P_t c_t(i)\, dt,$$

where $Q_{T_j(i)}$ is the price at $t=0$ of a bond that pays $T_{j+1}(i)$, and $M_{T_j^{+}(i)}(i)$ denotes money holdings just after $t = T_j(i)$. Formally, $M_{T_j^{+}(i)}(i) \equiv \lim_{t \to T_j(i),\, t > T_j(i)} M_t(i)$.

The first order conditions of this problem as well as the description of the steady state equations are described in the Appendix.

4. Welfare Cost of Inflation

4.1. Costs

We define the welfare cost of anticipated inflation by the amount of compensation needed to make households as well off with 10% inflation as they are with zero inflation.

Let r be the lower nominal interest rate and $\overline{r}$ the higher nominal interest rate that prevails under a higher rate of inflation. Let $U(r)$ denote the steady state aggregate intertemporal utility from all households, each with equal weight, when the steady state nominal interest rate is r. We have[2]

$$U(r) = \frac{1}{N} \frac{1}{\rho} \int_0^N \frac{\left[c_0 e^{g_c t} \left(\left(1-h_0\right) e^{g_l t} \right)^{\alpha} \right]^{1-1/\eta}}{1-1/\eta} dt.$$

Let $U(\overline{r}, \Delta)$ denote the steady state intertemporal utility for all households when each household receives a compensation Δ and all remaining equilibrium variables are set at their steady state values under the nominal interest rate $\overline{r}$. The compensation that makes the households indifferent between $\overline{r}$ and r is Δ_r, and is defined as

$$U(\overline{r}, \Delta_r) = U(r, 0).$$

2 It can be shown that $U(r) = \frac{1}{\rho} \frac{c_0^{1-1/\eta} \left(1-h_0\right)^{\alpha(1-1/\eta)}}{1-1/\eta} \frac{e^{\left(g_c + \alpha g_l\right) N \left(1-1/\eta\right)} - 1}{\left(g_c + \alpha g_l\right) N \left(1-1/\eta\right)}$.

4.2. Calibration and Results

We set standard values for the parameters. Usually, the estimates for η, the elasticity of intertemporal substitution, are above 0.1 and below 10. We set it equal to 1 the same value used in Silva (2012), Cooley and Hansen (1989) and Cooley and Hansen (1991). The intertermporal discount ρ is calibrated so that $r = 3\%$ implies zero inflation. The transfer cost γ is calibrated so that $m\left(r\right)$ matches the U.S. 1900-1997 annual average when r is the historical average nominal interest rate, 3.64%. That is, $m\left(3.64\right) = 0.26$. The preference parameter α is set so that labor hours is 30% of total time. The share of capital income in total income θ is set to one third. The depreciation rate δ is set to 5%, so that the share of investment in total expenditure is 19%. Government consumption g is set so that it corresponds to 18% of output when $r = 3.64$.

The value of Δ_r associated with an increase in inflation from 0% to 10% is equal to 0.8% of the output produced in the economy.

5. Conclusions

The demand for money decreases when inflation increases. Therefore, inflation imposes welfare costs because households divert resources to financial services to decrease their demand for money when inflation increases. The households change their demand for money by increasing the frequency of bond trades. In contrast, standard cash-in-advance models assume that the frequency of trades is fixed. Letting the frequency of trades vary implies a more elastic demand for money, a better fit to the data, and a higher estimate of the welfare cost of inflation.

In general, changes in inflation imply reactions on other fiscal instruments such as labor income taxes. That will be the case if the government wants to maintain an unchanged budget deficit. In this case, the other taxes usually decrease. These changes in the fiscal policy instruments have been ignored in the literature because lump sum taxes are assumed to be available.

We make two changes here. First, we consider that lump sum taxation is not available. Second, we take into account that households react to fiscal policy by changing their demand for money. As an increase in inflation that is revenue neutral implies smaller distortionary taxation, the demand for money decreases less and the increase in financial services is smaller than in the case with lump sum taxes. As a result, the welfare cost of inflation is smaller when only distortionary taxes are available.

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Appendix

Among the first order conditions of the households' problem, we have the intratemporal rate of substitution between leisure and consumption

$$\frac{\alpha c_t}{l_t} = \left(1-\tau\right) w\left(t\right) e^{-r\left(t-T_j\right)}, \text{ para } t \in [T_j\left(i\right), T_{j+1}\left(i\right)$$

where $w_t \equiv \frac{W_t}{P_t}$. The growth rates of consumption and leisure for each holding period $[T_j\left(i\right), T_{j+1}\left(i\right)), \ j = 1,2,\ldots,$ are

$$g_c \equiv \frac{\dot{c}}{c} = \frac{\alpha\left(\eta-1\right)-\eta}{1-\alpha\left(\eta-1\right)} r,$$

e

$$g_l \equiv \frac{\dot{l}}{l} = \frac{1-\eta}{1-\alpha\left(\eta-1\right)} r.$$

If $\eta = 1$, in particular, then $g_c = -r$ and $g_l = 0$ on each holding period, that is, consumption decreases at the nominal interest rate and leisure is constant. Let c_0 and h_0 be the levels of consumption and labor at the beginning of a holding period. We have

$$c_t = c_0 e^{g_c\left(t-T_j\right)} \text{ e } 1-h_t = \left(1-h_0\right) e^{g_l\left(t-T_j\right)} \text{ para } t \in [T_j\left(i\right), T_{j+1}\left(i\right)), \ j = 1,2,\ldots$$

The first order condition with respect to $T_j\left(i\right)$ implies

$$c_0 \frac{1-e^{\left(r+g_c\right)N_j\left(i\right)}}{\eta-1} - r c_0 \frac{e^{\left(\pi+g_c\right)N_j\left(i\right)}-1}{\left(\pi+g_c\right)} -$$
$$\left(1-\theta\right)\left(1-\tau\right) Y \frac{\left(1-h_0\right)\left(1-e^{g_l N_j\left(i\right)}\right)}{1-\left(1-h_0\right)\left(1-\tau\right)\frac{e^{g_l N_j\left(i\right)}-1}{g_l N_j\left(i\right)}} = \gamma\left(r-\pi\right),$$

where $N_j\left(i\right) = T_{j+1}\left(i\right) - T_j\left(i\right)$.

The first order conditions with respect to bonds and capital imply the standard non arbitrage condition

$$\left(r_t - \pi_t\right) = \left(r_t^k - \delta\right),$$

which says that the rate of return on bonds, on the left hand side, must be equal to the real return on physical capital, on the right hand side. The households must be indifferent between investing in bonds or capital.

The demand for money at time t of an household that made $j+1$ transfers is $M_t\left(i\right) = \int_t^{T_{j+2}\left(i\right)} P_s c_s\left(i\right) ds$, while the demand for money of an agent at time t that made j transfers is $M_t\left(i\right) = \int_t^{T_{j+1}\left(i\right)} P_s c_s\left(i\right) ds$, for $j = 1,2,\ldots$. The aggregate real money demand at date t is $m_t \equiv \int_0^1 M_t\left(i\right) di / P_t$.

We want to study the steady state equilibrium. The equilibrium steady state has the properties that holding periods, across households and across time, have the same duration, N, and that all households behave similarly during their holding periods. Thus, all households readjust their portfolio in the same way, being equal the fraction of households that readjust their portfolio at any moment in this interval. Household $i \in \left[0,1\right]$, which initially adjusts the portfolio at date $n\left(i\right) \in [0,N)$, also readjusts the portfolio at dates $n\left(i\right)+jN$ for $j=1,2,\ldots$.

As we are concerned with the steady state equilibria, we drop the subscript t from the notation. There are nine independent equilibrium static equations that can be used to determine nine steady state equilibrium variables, c_0, N, τ, m, h_0, w, Y, K, and H.

The steady state equilibrium equations are: the production function

$$y = AK^{\theta}H^{1-\theta},$$

the demand for capital

$$\left(\rho+\pi\right)K = \theta y,$$

the demand for labor

$$wH = \left(1-\theta\right)Y,$$

the aggregate supply of hours by households

$$1-H = \left(1-h_0\right)\frac{e^{g_l N}-1}{g_l N},$$

the intratemporal condition of households

$$\left(1-h_0\right) = \frac{\alpha c_0}{w\left(1-\tau\right)},$$

the government budget constraint

$$rm + \tau\left(1-\theta\right)y = g,$$

the market clearing condition for goods

$$c_0\left(\frac{e^{g_c N}-1}{g_c N}\right) = \left(y - \frac{\gamma}{N} - g - \delta\frac{\theta y}{\rho+\delta}\right),$$

the condition on the choice of the duration of the holding period by households

$$\begin{aligned}&\frac{rN}{\alpha}\left[\left(\frac{1}{\eta-1}\right)\left(\frac{e^{rN}-1}{rN}\right)+\frac{e^{\pi N}-1}{\pi N}\right]+\frac{\gamma}{w}\left(r-\pi\right)\\ &=\left[r\frac{e^{\left(\pi+g_h\right)N}-1}{\left(\pi+g_h\right)N}\left(1+\frac{1}{\alpha}\right)+\left(\frac{\frac{1}{\alpha}}{\eta-1}-1\right)\left(r+g_h\right)\left(\frac{e^{\left(r+g_h\right)N}-1}{\left(r+g_h\right)N}\right)\right]Nh_0,\end{aligned}$$

and the money demand

$$m = \frac{c_0}{g_c+\pi}\left(e^{g_c N}\frac{e^{\pi N}-1}{\pi N} - \frac{e^{g_c N}-1}{g_c N}\right).$$

REVISITING THE EFFECTIVENESS OF MONETARY AND FISCAL POLICY IN THE US, MEASURED ON THE BASIS OF STRUCTURAL VARS*

*Manuel Coutinho Pereira***

ABSTRACT

This paper presents evidence on time-variation of the effectiveness of monetary and fiscal policies in the United States drawn from structural VARs. The results for a traditional model of fixed coefficients, estimated on the basis of rolling samples, point to very unstable output responses to policy shocks and a clear weakening over time. In the case of fiscal shocks, in particular, the multipliers have non-conventional signs during part of the period considered. When temporal variation is incorporated directly through a specification with variable coefficients, the profile of output responses becomes more stable. In this case, the results indicate a near stabilization of the impact of monetary policy in recent years, while for fiscal policy a weakening continues to take place.

1. Introduction

The length and severity of the most recent recession (2008-09) in the United States brought to the fore the discussion about the stabilizing role of fiscal and monetary policies, as it showed that at present cyclical fluctuations could be larger than those characterizing the «Great Moderation» that preceded the onset of the recession. Such developments have shaken the belief that monetary policy would be sufficient to address the imbalances (of small size) between aggregate demand and supply, reopening the debate on the stabilizing role of individual policies and their interaction. In addition, the rehabilitation of fiscal policy's importance as a stabilization tool has highlighted the uncertainty that prevails among economists concerning its effects on economic activity, as demonstrated by the controversy surrounding the impact of stimulus measures implemented during the recession by the Obama Administration. This uncertainty stems, firstly, from the predictions of different theoretical frameworks, with the neoclassic models postulating more modest impacts of fiscal policy on GDP than new-Keynesian models.

In this context, the role of empirical research on the macroeconomic effects of fiscal and monetary policies is of great importance. The SVAR models (initial contributions include Bernanke and Blinder, 1992, and Christiano, Eichenbaum and Evans, 1999, for monetary policy, and Blanchard and Perotti, 2002, for fiscal policy)[1] are one of the approaches used for this purpose, in which the derivation of shocks and mechanisms of propagation to the economy are part of the estimation process. This article revisits and updates, extending the estimation period to the present, evidence on GDP responses to both policies under an SVAR model, with special emphasis on temporal variation. Indeed, several studies have found evidence of subsample-sensitivity of the impulse-response functions estimated in these models, as well

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1 In a broad sense, considering the models identified by recursive schemes also as structural.

as in alternative approaches such as the narrative, particularly in the case of fiscal policy (e.g. Perotti, 2005, and Pereira, 2009b) but also of monetary policy (Boivin and Gianonni, 2006, and Boivin, Kiley and Mishkin, 2010). At the same time, the literature has paid increasing attention to the dependence of fiscal multipliers on «regimes», in particular stemming from the cyclical position of the economy or a possible non-reaction of monetary authorities to the impact of fiscal stimulus on activity because the federal funds rate hit the «zero lower bound» (Romer, 2011, Auerbach and Gorodnichenko, 2012, and Christiano *et al.*, 2011).

The measurement of the impact of policies on the economy is hampered by several problems, namely, bi-directional causality between the policy variables and economic activity (simultaneity) and the possibility that agents change their behavior when policy measures are announced, prior to implementation (anticipation). Simultaneity arises both for monetary and fiscal policy (particularly in the case of taxes and social transfers), while anticipation should be particularly relevant for the latter. Section 2 provides a brief discussion about the potential impact of this issue in the case of fiscal policy VARs, an issue that has been much debated.

The results presented in the course of this paper are based on a model consisting of five equations, three of which are structural: a monetary policy rule and two equations for the fiscal variables, taxes net of transfers and acquisition of goods and services, which capture the automatic responses to the economy and government's reaction function. The other two equations concern output and prices and do not have a structural interpretation, as the responses to the respective shocks are not being considered. The joint identification of the two budgetary shocks, on the one hand, and monetary shocks, on the other, has the advantage of explicitly dealing with orthogonality among them, ensuring a higher accuracy in the measurement of responses. Section 3 describes the macroeconomic system and the identification restrictions imposed.

Section 4 presents a first set of empirical results obtained through the estimation of the described system in a traditional fixed-coefficient specification. In this section, time-variation of responses is introduced informally by the estimation on the basis of a rolling sample. The results of this model with fixed coefficients indicate a significant weakening of the impact of fiscal policy shocks on output, particularly from mid-90s on. In the case of taxes net of transfers, such tendency becomes more marked when the very recent period is included in the sample. Although structural VARs are often associated with conventional multipliers of significant size, as those presented in the initial contribution of Blanchard and Perotti (2002) (see the survey presented in Ramey, 2011b), a careful analysis of time variation in the impulse-responses calls this interpretation into question. The results also point to a significant attenuation around 1980 of the impact of unanticipated monetary policy, with a sharp fluctuation in its effectiveness since then and a particularly reduced impact in recent years. This section also provides insight into how the documented weakening in output responses has affected the stabilizing role of policies during the activity contractions since mid-70s.

In section 5, temporal variation of responses is introduced in a formal way under the same model, through a specification with time-varying coefficients that are assumed to follow a random walk. This specification explicitly accounts for the possibility of time-variation in the parameters and is general enough to accommodate both gradual and sudden changes. In this case, the results are obtained by running Bayesian simulations. The specification with variable coefficients is consistent with a weakening of the role of policies over time (more markedly so in the case of fiscal policy), but to a lesser extent than implied by a traditional fixed-coefficient modeling. Still, the evidence contradicts the assumption of a greater effectiveness of fiscal policy during the recent period in which the federal funds rate has remained at the «zero lower bound» (Romer, 2011).

2. On the anticipation of fiscal policy shocks in structural VAR models

The use of VARs to estimate the effects of fiscal policy has been criticized for its lack of robustness against the problem of anticipation (Ramey, 2011a), particularly vis-a-vis the narrative approach. Recall that in the latter (represented by contributions such as Romer and Romer, 2004, for monetary policy and Romer and Romer, 2010, Pereira, 2009b, and Ramey, 2011a for fiscal policy), the characterization and quantification of shocks is made beforehand, using narrative or other sources, and the researcher has complete flexibility in their dating. The propagation mechanisms are estimated in a second stage on the basis of a reduced-form model.

Indeed, changes in the tax system and many measures on the expenditure side are often announced in advance of approval (for example, when the annual budget is presented), and there may be further delay until implementation. To the extent that agents change their behaviour when they become aware of such measures, the timing of shocks derived from structural VARs will be incorrect for the anticipated part. What is the importance of these effects, in practice? There have been micro studies (see Johnston *et al.*, 2006, and references therein) that assess the behaviour of agents when they possess information about pending fiscal shocks (the so-called «natural tax experiments»). Such studies tend to conclude that payments and refunds of taxes have a contemporary impact on consumption, even when agents could anticipate them. In this respect it is illustrative that in the abovementioned work by Romer and Romer (2010), following the narrative approach, the benchmark tax shocks are dated according to the moment when revenue is impacted. It is plausible to assume that households do not smooth consumption significantly in anticipation of small changes in disposable income. One may also note some macroeconomic literature (Mertens and Ravn, 2010) that seeks to correct anticipation effects in fiscal policy VARs, concluding that such correction does not qualitatively change the evidence drawn. Thus, anticipation does not seem likely to invalidate the results from the estimation of fiscal VARs, and more so in the present study that focuses on temporal variation of output responses.

3. Equations and identification restrictions

As mentioned, the results presented in this article are based on a macroeconomic system that includes five endogenous variables: taxes net of transfers (NT_t), acquisition of goods and services (G_t), approximately equal to government consumption and investment (see footnote 4), and GDP (Y_t), in real and *per capita* terms, the federal funds rate (FF_t) and inflation measured by GDP deflator (P_t). The data have a quarterly frequency and so the VAR is specified with four lags. The option for a small system, with the minimum number of variables allowing the joint study of the effects of the two policies, is justified by the estimation based on relatively short rolling samples and the need to limit the number of parameters in the Bayesian simulations.

The system of equations in its structural form, in the version with fixed parameters (in the version with variable parameters, these are also indexed to t), specifying only the contemporaneous part of the model, is:

$$G_t = a_0 + a_1^* P_t + coefficients/lagged\ endogenous\ variables + v_t^G,$$

$$NT_t = b_0 + b_1^* Y_t + b_2 P_t + coefficients/lagged\ endogenous\ variables + b_3 v_t^G + v_t^{NT},$$

$$P_t = c_0 + c_1 G_t + coefficients/lagged\ endogenous\ variables + v_t^p,$$

$$Y_t = d_0 + d_1 G_t + d_2 NT_t + d_3 P_t + coefficients/lagged\ endogenous\ variables + v_t^Y,$$

$$FF_t = e_0 + e_1 G_t + e_2 NT_t + e_3 Y_t + e_4 P_t + coefficients/lagged\ endogenous\ variables + v_t^{FF}.$$

The VAR methodology is characterized by the imposition of identification restrictions on the contemporaneous coefficients only, essentially exclusion restrictions, while the block of lagged endogenous variables is freely estimated. The key assumption in the identification of fiscal shocks is to assume (following Blanchard and Perotti, 2002) that implementation of measures by government as a response to macroeconomic developments occurs with at least one quarter delay. Thus, the contemporaneous GDP coefficient in the equation of taxes net of transfers captures automatic responses only, notably the effect of automatic stabilizers built in the tax and social transfer systems. By the same logic, contemporaneous GDP is not included in the equation of government consumption and investment, as in this case it is reasonable to assume the absence of an automatic response. Note that any systematic responses by government to macroeconomic developments, namely the fiscal policy rule, will be reflected in the block of lagged endogenous variables[2] (along with persistence of fiscal variables and their lagged responses to the economy). Taxes net of transfers may respond within the quarter to prices, and this channel is left open for public consumption and investment as well, as the budgetary variables enter the system in real terms.

The orthogonalization of innovations in net taxes vis-a-vis innovations in public consumption and investment is done by ordering this last variable in the first place. This is an arbitrary assumption since the reverse ordering (considering net taxes first) would be equally plausible. It should be noted, however, that changes in the order of budgetary variables have little effect on the estimate of their impacts on economic activity, the focus of this study. The equation for the federal funds rate is the monetary policy rule. The identification of innovations in this equation follows the usual assumption that monetary authorities observe the macroeconomic developments and may react to them within the quarter, while variables such as output and prices respond with a certain delay to changes in interest rates. This identification scheme is a simplified version of the one in Pereira (2009a). The version followed here does not allow a contemporaneous reaction of prices to net taxes. Furthermore, it closes the response channel of net taxes to the interest rate instead of the converse one, although there is evidence of a positive semi-elasticity of taxes to the short-term interest rate within the quarter. Such simplifications are, however, necessary as they make it possible to map this identification scheme into a recursive one, with a view to simulating the system using the Bayesian methods in Carter and Kohn (1994). It is further noted that since these simplifications do not relate to the identification of the innovations in each of the variables relative to the innovations in output, they do not significantly interfere with the analysis.

Finally, in order to satisfy the necessary condition for identification, the order condition, with exact identification, one imposes a contemporaneous non-reaction of prices to output (although, as stated, only policy shocks are given a structural interpretation). It should be noted that two of the contemporaneous coefficients in the first two equations - a_1* and b_1* - are not estimated but calibrated on the basis of institutional information about taxes and transfers[3] (in the specification with fixed parameters the average value over the sample period is taken).

2 In the fiscal policy rules it is customary to include a public debt stabilization motive. In our system the omission of debt is justified by the fact that actions to deal with accumulated past deficits are roughly exogenous to current macroeconomic developments. It is therefore acceptable that they are part of the shock that is used to evaluate the effects of fiscal policy. Note that evidence that debt significantly enters the budgetary equations of a linear model as estimated here is anyway weak (see Pereira, 2009a).

3 Following the method of Blanchard and Perotti (2002), which uses the elasticity of the income tax rate to the wage calculated by Giorno *et al*. (1995) and later updated by Girouard and André (2005).

4. Effectiveness of monetary and fiscal policies in the fixed-coefficient model

4.1. Output responses to exogenous shocks

With the identification scheme described in the previous section, the specification with fixed coefficients can be estimated by instrumental variables or a more general method, such as maximum likelihood. Recall that the model is estimated with quarterly data - ending in the 3rd quarter of 2011 - for GDP, taxes net of transfers and acquisition of goods and services, in logs of real and *per capita* figures, the federal funds rate and the change in the log GDP deflator, in annualized terms. The series, except for the interest rate, are seasonally adjusted at source.[4] The estimation is based on a rolling sample of 35 years; at the beginning, however, a sample period of 25 years only is taken, gradually increasing up to 35 years, to allow the computation of impulse-responses prior to 1980 (the first sample ends in 1973:1, as the usable observations start in 1948:2). The presentation of results for the period before 1980 is important, particularly in the case of monetary policy for which there is evidence of a structural break around this time. The shaded areas refer to the contractionary periods according to the NBER.

The output responses (in percentage) to monetary and fiscal shocks are shown in Chart 1, with confidence bands for the 16th and 84th percentiles[5], for four horizons: within the quarter and one, two and three years ahead. The dates on the axis refer to the last observation in the sample window. Fiscal shocks have the dimension of 1 percent of GDP, and thus responses to them may be interpreted as multipliers; the monetary policy shocks have the size of 1 percentage point (p.p.) of the federal funds rate.[6]

As far as fiscal shocks are concerned, the fixed-coefficient model implies a weakening of their GDP impact, both in the case of net taxes and government consumption and investment. The one-year-ahead multiplier for net taxes gradually falls (in absolute terms) starting in mid-90s, from between -1.5 and -1.0 to about 0, a decade later. In the very recent period this specification even indicates a change of sign. Regarding persistence (i.e. for longer time horizons), the profile is similar but there is no sign reversion in recent years. The one-year-ahead multiplier for purchases of goods and services stands at about 1.5 until mid-90s; there is then a drop to a level around zero where it approximately remains afterwards. The multipliers for longer horizons show a more pronounced break, assuming negative values in the last decade and a half (although 0 is within the confidence bands). When the length of the sample window is shortened, the instability of multipliers increases, namely for acquisition of goods and services. This evidence contradicts the association between the structural VAR model (with fixed parameters) and sizeable budgetary multipliers with conventional signs. The estimates appear to be quite sensitive to dropping observations from the sample and including new ones, as shown by the «peaks» in responses (in particular, for fiscal innovations in the sample ending in 2009:1).

With regard to monetary policy shocks, there is no output reaction within the quarter owing to the identification restrictions, as variables do not respond contemporaneously to the federal funds rate. The

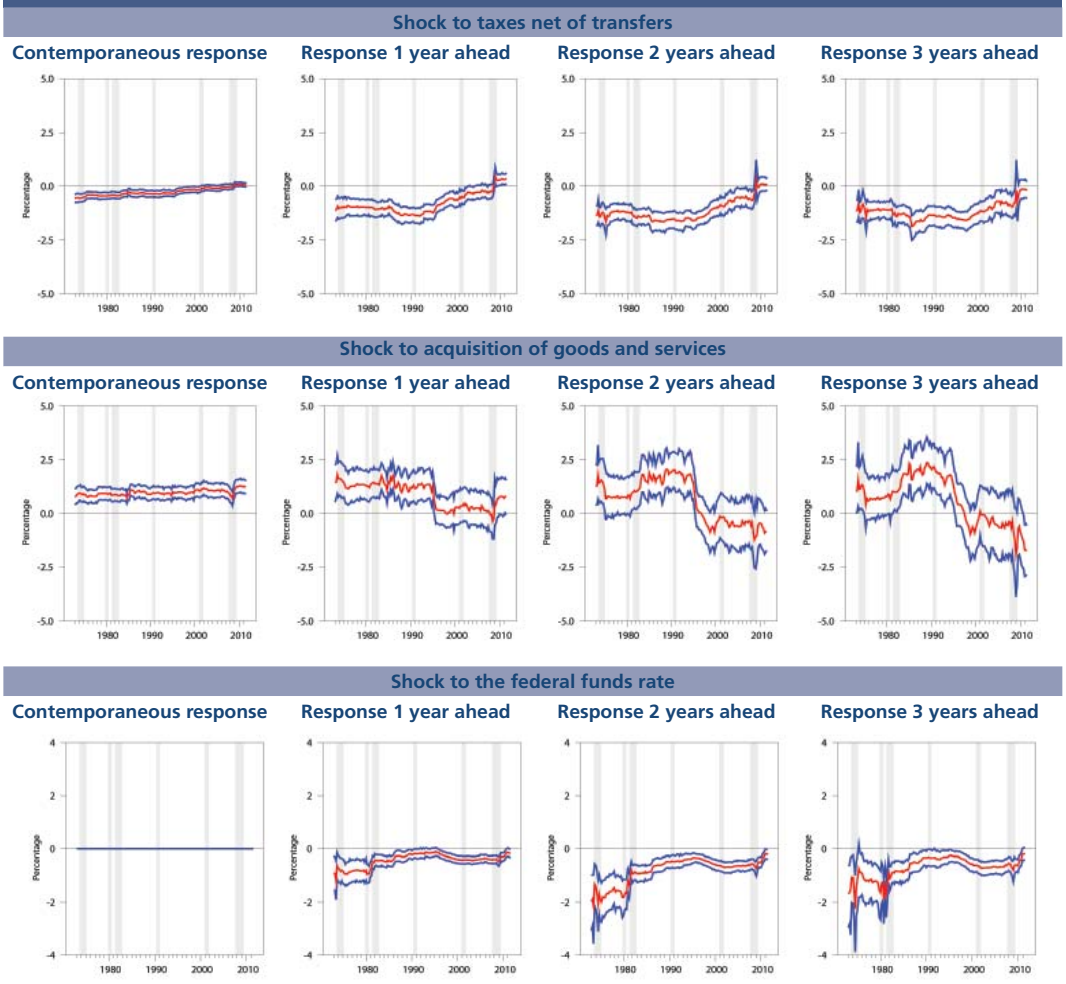
4 Budgetary data, output, output deflator and population were taken, respectively, from Tables 3.1, 1.1.5, 1.1.4 and 2.1 of the NIPA (Bureau of Economic Analysis). Note that the acquisition of goods and services is calculated as government consumption, excluding consumption of fixed capital, added to investment. The federal funds rate was taken from the FRED database (Federal Reserve Bank of St. Louis). Unlike the other series, available from 1947:1, the latter series is available only from 1954:3 on. In order not to lose the initial values in the sample, for 1947:1-1954:2 the interest rate on 3-month Treasury bills was considered. Other data used in calibrating the elasticities, for income and social transfers, are from Tables 3.12, 2.1 and 1.10 of the NIPA.

5 The confidence bands are calculated as follows. A reduced-form VAR is estimated for each of the samples. On the basis of the point estimate of the covariance matrix and assuming an inverse-Wishart distribution, extractions of that matrix are made (to which the structural decomposition is applied) and subsequently of the coefficient vector, assuming a normal distribution conditional on the covariance matrix previously extracted. The statistics underlying the confidence bands are obtained on the basis of 1000 extractions.

6 Note that the scale of the responses may differ from other studies that have estimated monetary policy VARs because in the present study real and *per capita* output is taken.

Chart 1

TIME-PROFILE OF OUTPUT RESPONSES IN A STRUCTURAL VAR WITH FIXED COEFFICIENTS



Source: Author's calculations.

Note: Impulse-response functions for policy shocks in the structural VAR model described in section 3 in a specification with fixed parameters, estimated on the basis of rolling samples ending at the date indicated on the axis (the final quarter varies between 1973:1 and 2011:3). The sample period is 35 years, however, for samples ending before 1983:1, the sample period is the maximum allowed by the available observations, with a minimum of 25 years. The shaded areas show the NBER recessions.

fixed-parameter model features a drop in effectiveness as well, in this case by early 80s (a result that is in line with other literature on this subject, quoted above). Prior to that, it is estimated that an increase in the federal funds rate by 1 percentage point triggered a reduction of about 1 percent in real *per capita* GDP for the one-year horizon. This response decreases to about -0.5 percent, and subsequently there is a fluctuation between this value and 0, with particularly low impacts around 1995 and in the very recent period. Regarding the persistence of the shock, the time-profile is similar, but the amplitude of fluctuation after 1980 somewhat larger.

4.2. Stabilizing impact of endogenous policies

This section seeks to quantify the loss of effectiveness of monetary and fiscal policy (documented in the previous section for the respective exogenous shocks) with regard to the stabilizing role. Note that this role depends on not only the effects of policies but also the extent to which they are used. Since now the objective is measuring the effect of endogenous policies, it is necessary to resort to the so-called counterfactual simulations (in the spirit of Sims and Zha, 1998, and Bernanke, Gertler and Watson, 1997). These simulations compare, during recessionary periods, the actual behaviour of policy variables and

output with their behaviour when the system is simulated under counterfactual assumptions, namely (i) absence of the exogenous component and (ii) absence of the endogenous component of policies. The simulation period begins in the quarter subsequent to the maximum in economic activity and goes on until the end of the recession; simulations are carried out for each of the six contractions since mid-70s up to the present day. The model estimates underlying the simulations are obtained on the basis of the sample window of 35 years ended in the last quarter of each recession (for the first two recessions this procedure is also followed, but the sample period available is shorter).

Let's take the equation for G_t (see section 3) as an example. In exercise (i) the system is simulated with the parameters in all equations according to their estimates, and the shocks according to their estimated trajectories, except for v_t^G that is set to 0. In exercise (ii) the system is simulated with the variable G_t determined by the respective exogenous shocks (i.e. following a random walk), equating to 0 all parameters in this equation except the coefficient of G_{t-1} which is set to 1 (the parameters in the other equations are set in accordance with the respective estimates and shocks in all equations with their estimated trajectories). The change in policy variables during recessions is broken down into their exogenous and endogenous components, which obtain as the difference between the actual level and simulated level of the variable at issue in the trough of recession, respectively, in exercises (i) and (ii) above. The effect on economic activity is measured in the same way, but taking the actual and simulated GDP levels. Implementation of such simulations, besides having a somewhat mechanical character, is subject to the caveat (stemming from the Lucas critique) that agents could have reacted differently if endogenous policy had differed from the historical trajectory. Therefore, these simulations will be more credible if the deviation from that trajectory is not too protracted (the considered recessions lasted on average about 5 quarters).

Decomposition of changes in variables into the endogenous and exogenous components

Table 1 presents the breakdown of changes in taxes net of transfers, acquisition of goods and services and the federal funds rate during recessions, into their systematic and exogenous components. Note that the actual change in policy variables is not exactly split into these two components, because structural shocks propagate through the system interacting with the respective endogenous structure. The simulation exercise will not take into account, by definition, such an interaction, and thus provides an approximate breakdown only.

Table 1

STRUCTURAL VAR WITH FIXED COEFFICIENTS: DECOMPOSITION OF MOVEMENTS IN POLICY VARIABLES DURING RECESSIONS

Recessions[a]	Net taxes (%, cumulative)			Aquisition of goods and services (%, cumulative)			Federal funds rate (p.p., cumulative)		
	Actual change	Exogenous comp.[c]	Endogenous comp.	Actual change	Exogenous comp.	Endogenous comp.	Actual change	Exogenous comp.	Endogenous comp.
1973:04-1975:01	-16.3	-3.7	-12.8	4.4	1.2	4.5	-3.7	-0.1	-4.8
1980:01-1980:03	-8.0	1.4	-9.5	-1.6	-0.4	-1.1	-5.2	-2.0	-3.7
1981:03-1982:04	-18.4	-1.5	-19.8	3.9	1.9	1.9	-8.3	-2.5	-5.7
1990:03-1991:01	-6.8	-0.4	-6.4	1.2	-0.3	1.5	-1.7	0.1	-1.9
2001:01-2001:04	-11.8	-4.5	-4.1	2.9	1.1	1.6	-3.5	-0.7	-2.5
2007:04-2009:02	-69.9[b]	-31.9	-39.8	2.4	-0.8	3.4	-4.3	1.7	-5.6

Source: Author's calculations.

Notes: (a) The dates indicate the beginning and the end of recessions. **(b)** As the fiscal variables are taken in logs in the model, the respective actual percentage change is approximated, as usual, by the difference in logs. This approximation works well, except in the case of net taxes in the 2008-2009 recession (given the magnitude of the change), where the decrease measured by the difference in logs is larger than the actual decrease, which stands at about 50 percent. **(c)** The exogenous and endogenous components are equal to the difference at the end of the simulation period (last quarter of the recession) between the actual figure and the simulated figure, shutting down, respectively, the responses/shocks associated with each component. The simulation starts in the quarter following the peak in activity and uses the sample window ending in the last quarter of the recession.

The figures in Table 1 indicate a strong endogenous counter-cyclical movement for taxes net of transfers, which should mainly reflect the performance of automatic stabilizers. As the discretionary fiscal actions in response to macroeconomic developments in the United States have been comparatively infrequent, these will be partly captured by the exogenous component (in spite of their endogenous character), overestimating it. In fact, this component had a large magnitude in the last two recessions, reflecting contemporary legislative measures taken, in whole or in part, as a reaction to these episodes, as the Economic Growth and Tax Relief Reconciliation *Act* of 2001, the Economic Stimulus Act of 2008 and the American Recovery and Reinvestment *Act* of 2009 (initial quarters).[7] It is worth noting that the observed decrease in net taxes during the 2008-09 recession has no correspondence in previous recessions (see also note (b) to Table 1).

The exercise indicates that the endogenous movements in public consumption have been much more modest by comparison, even without a consistent counter-cyclical (i.e. positive) sign. Therefore the emphasis on the spending multiplier found in the literature (which is due to the fact that spending, notably that of a military nature, is relatively less affected by simultaneity with output) is somewhat misplaced[8], as net taxes are the budgetary variable primarily used for macroeconomic stabilization (automatic and, to a lesser extent, discretionary).

The simulation shows a significant endogenous variation in the federal funds rate during recessions, in line with the monetary policy rule. Note that the reduction in this variable during the 2008-09 recession, although of the order of magnitude observed in previous recessions in absolute terms, was more important in relative terms, since the interest rate level was lower when the recession started and the «zero lower bound» was hit in the course of it. This implied that the variation in the instrument has fallen short of that implied by the monetary policy rule, which translates into a positive estimate of the exogenous component. It is worth noting that during this period, monetary policy included the implementation of non-conventional measures, which are not captured by this exercise. In the recessions in early 80s interest rate reductions went beyond what the rule prescribed, possibly signaling that considerations about economic recovery overrode inflation concerns, which tended to limit the amplitude of the decrease in interest rate.

Impact of the endogenous component on output

Table 2 shows the impact of movements in endogenous policy variables, previously determined, on real and *per capita* GDP during contractions in economic activity. The stabilizing effect is calculated as the output loss avoided at trough of recession, i.e. the difference between the actual level of this variable and the simulated level shutting down the contribution of endogenous policies. By comparing that effect and the actual contraction in activity in each downturn, it is possible to have an idea of their stabilizing role. The counterfactual multiplier provides an indication of the effectiveness of endogenous fiscal policy and is obtained as the ratio between the loss of output avoided and the change in the respective variable (at the end of recession). A similar indicator is calculated for the federal funds rate, which evaluates the decrease in output avoided by percentage point of change in interest rate.

The exercise indicates that net taxes played a very important stabilizing role in the recessions up to early 90s, reflecting the magnitude of the counter-cyclical movements in the variable (Table 1) combined with estimated multipliers between -1 and -2 (i.e. of the order of magnitudes obtained for exogenous policy in the period). In these episodes, the stabilizing role resulting from the simulation is substantial, ranging from about 1/3 for the shorter recessions to a maximum of 2/3 in the 1981-82 recession. In the last two

7 Around the 1973-75 recession, an important discretionary counter-cyclical measure was taken - the *Nixon tax rebate* - but this was already implemented in the quarter following the end of the recession.

8 On this point, see Cogan and Taylor (2011).

Table 2

STRUCTURAL VAR WITH FIXED COEFFICIENTS: IMPACT ON OUTPUT OF ENDOGENOUS MOVEMENTS IN POLICY VARIABLES

Recessions[a]	Actual change in GDP	Net taxes		Acquis. of goods and services		Federal funds rate	
		Stabilizing effect.[b]	Multiplier[c]	Stabilizing effect	Multiplier	Stabilizing effect	Effectiveness indicator
1973:04-1975:01	-4.60	3.6	-1.43	0.8	0.95	1.3	-0.27
1980:01-1980:03	-2.83	1.4	-0.84	-0.2	1.17	0.1	-0.03
1981:03-1982:04	-3.81	7.1	-2.00	0.4	1.18	1.3	-0.23
1990:03-1991:01	-2.04	1.0	-0.84	0.2	0.82	-0.1	0.04
2001:01-2001:04	-0.04	0.0	-0.06	0.3	1.37	0.2	-0.08
2007:04-2009:02	-6.56	-1.8	0.29	0.4	0.63	1.3	-0.24

Source: Author's calculations.

Notes: (a) The dates indicate the beginning and the end of recessions. **(b)** The stabilizing effect is equal to the difference at the end of the simulation period (last quarter of the recession) between the actual value and the simulated value of output, shutting down the endogenous response of policy variables. **(c)** The fiscal multipliers and the monetary policy effectiveness indicator relate the output loss avoided with the change in policy variables. The simulation starts in the quarter following the peak in activity and uses the sample window ending in the last quarter of the recession.

recessions, the methodology captures a nil or a destabilizing impact of net taxes, in line with the loss of efficiency in the recent period shown in Chart 1. It is worth noting that in spite of the underestimation of the endogenous component vis-a-vis the exogenous component in the two episodes (see the previous section), this result is due to the multipliers. Even with the caution that the interpretation of results from a mechanical exercise of this nature requires, evidence in the specification with fixed coefficients suggests that the absence of the moderating influence of net taxes, in sharp contrast with previous recessions, is a factor explaining the severity of the 2008-09 recession.

The estimated contribution of acquisition of goods and services as an instrument of stabilization is negligible, due to the small endogenous change in this variable. The multiplier, despite some fluctuation, has positive values, not indicating the break shown in Chart 1 from mid-90s on for the one-year and longer horizons. This can be explained by the fact that shocks to purchases of goods and services have maintained their effectiveness for very short horizons (see the contemporary multiplier in the same chart), which nevertheless cover an important part of recession length.

The evidence from counterfactual simulations suggests that the stabilizing effect of systematic monetary policy was similar in the three longer recessions, in absolute terms (in relative terms that effect ranges from 15 to 25 percent, respectively, in the 2008-09 and 1981-82 recessions). The indicator of relative efficiency also keeps a similar value in all three episodes. In the shorter recessions, however, the stabilizing role of the federal funds rate appears as insignificant. This might be explained by some delay in output response to monetary policy innovations (note that this can be partially induced by the identification restriction that these innovations do not impact GDP within the quarter). In short, the fixed-coefficient specification indicates such a loss of efficiency of taxes net of transfers that they would have virtually ceased to contribute to moderate recessions, this role being currently almost confined to monetary policy.

5. Output responses in the model with variable coefficients

This section presents the results of the simulation of the model under consideration in a specification with variable coefficients, using Bayesian methods. This specification is based on the key assumption that coefficients change gradually over time, according to a random walk. The parameters in the equations are grouped into three blocks containing, respectively, the coefficients of reduced form, the coefficients

of contemporaneous regressors and the variances of structural innovations.[9] Each block has the form of a linear state-space model to which the algorithm proposed by Carter and Kohn (1994) is applied. The simulation process iterates over the various blocks, using Gibbs sampling, according to a «filtered» variant, in which the full simulation process is carried out sequentially, stretching the sample one year at a time. A detailed discussion of the specification of prior distributions (for the initial states of the parameters and their volatility) and the simulation process is beyond the scope of this article.[10] The methodology is described in Primiceri (2005) and Cogley and Sargent (2005), applied to monetary policy VARs, and Pereira Lopes (2010), applied to a fiscal policy VAR. Note that the identification scheme used in the simulations is a reparameterized version of the scheme presented in section 3, giving rise to the same impulse-responses, but implying that all contemporary regressors are predetermined.

Chart 2 shows the median and confidence intervals corresponding to the 16th and 84th percentiles of impulse-response functions simulated for the period 1973:3-2011:3 (dates on the axis correspond to the time of parameter indexation).[11] The horizons are identical to those in Chart 1 and similarly responses to fiscal shocks have the interpretation of multipliers and monetary policy shocks have the dimension of 1 p.p. in the interest rate. The profile of output responses to net tax innovations is consistent with a weakening, but to a much lesser extent than shown in Chart 1. The multiplier one year ahead is about -1.5 up to mid-90s, later falling (in absolute value) to just above -0.5 until the end of the sample[12]. The shock persistence has a very similar profile. For purchases of goods and services, the one-year-ahead multiplier has a slightly rising profile in the initial period, from a little above 0.5 to close to 1.0 by 1996, followed by a reversion to the initial figures; in the last three years of the period a drop to values below 0.5 takes place. This pattern of change in effectiveness also occurs, more prominently, for longer time horizons. Thus, although the specification with variable parameters reconciles evidence from structural VARs with conventional budgetary multipliers, the magnitude of the latter is quite small, standing at the «usual» range's lower limit in the very recent period. In the case of monetary policy shocks, a weakening of the GDP impact around 1980 occurs, from about -1.25 to close to -0.75 percent, which continues, but quite attenuated, to -0.5 percent by the end of the sample. Regarding persistence there is an approximate stabilization after 1980.

One now examines the responses to fiscal shocks around recessions, to assess any increase in policy effectiveness when there is excess capacity in the economy, which finds empirical support in Auerbach and Gorodnichenko (2012). In the case of net taxes there is a very small increase (almost unnoticeable in the chart) during the longer recessions, but it is doubtful whether to attribute any meaning to such small variations. In the case of acquisition of goods and services, the mentioned hypothesis has no correspondence in the results.[13] The evidence is particularly discouraging for an enhanced effectiveness when the interest rate is at the «zero lower bound». As seen, there is no palpable upsurge in responses

9 The random walk hypothesis is jointly assumed for the parameters in each block, i.e. combining these parameters into a vector θ_t, $\theta_t = \theta_{t-1} + \varepsilon_t$ holds, where ε_t is a normal random variable with zero mean and a given covariance matrix.

10 The prior distributions of initial parameter values are normal calibrated by estimating a fixed-coefficient VAR over the training sample 1948:2-1967:4; the prior distributions of the hyperparameters are conjugate inverse--Wishart, calibrated the same way as described in Pereira Lopes (2010). The simulation period begins in 1968:1, the first end-date is 1973:3 the and last one is 2011:3 (the stability condition is not imposed). For each final date, 10 000 iterations of Gibbs sampling are run, of which 2 000 are kept for the calculation of impulse--responses; the «burn-in» period comprises 2 500 iterations. In order to reduce the number of coefficients in the block of reduced-form parameters, only two lags of the variables are considered.

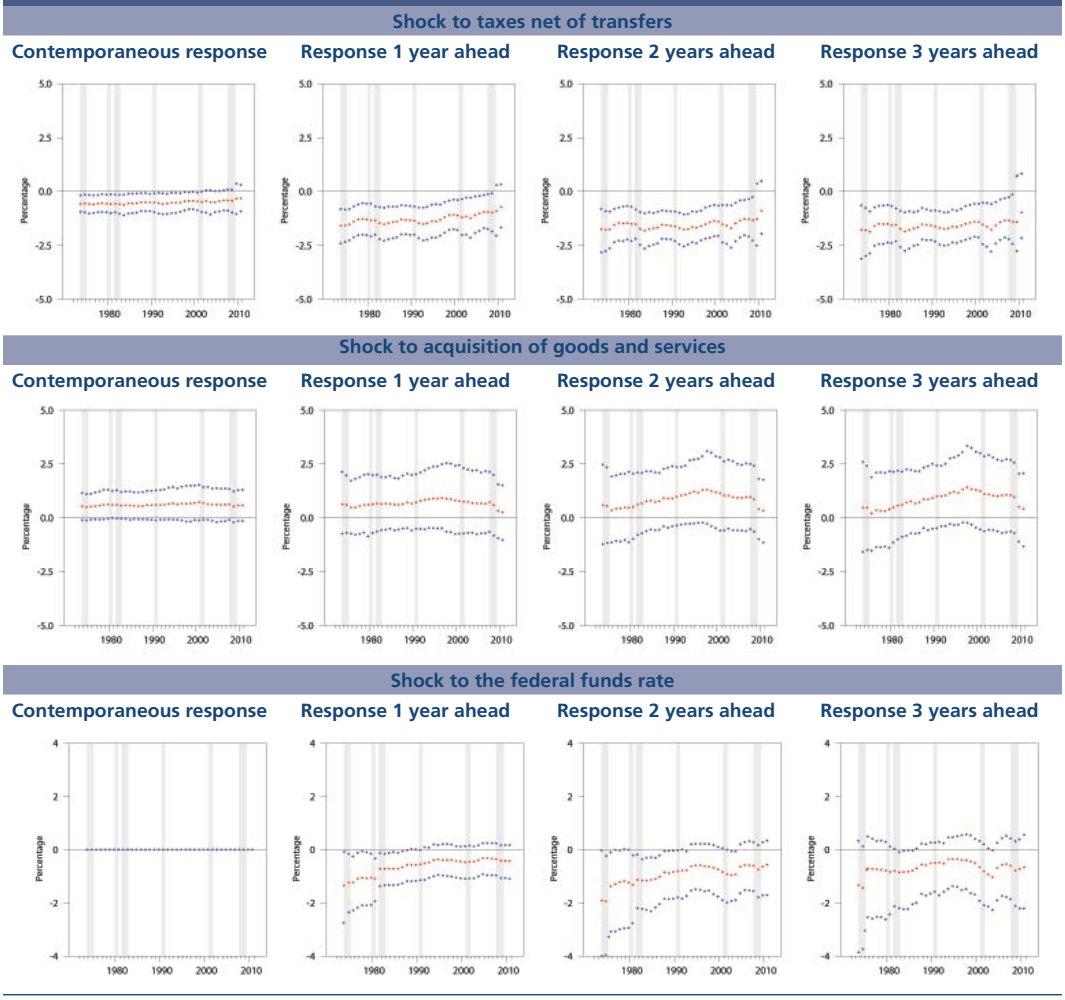
11 One follows the usual convention to present a simplified version of the impulse-response functions in which the response to shocks at time t depends only the on the parameters indexed to this date, for all horizons.

12 In Pereira and Lopes (2010) there is a strong weakening in the period following the 1973-75 recession without counterpart in Chart 2, which may reflect the fact that in that study the monetary policy variable is omitted.

13 The model estimated by Auerbach and Gorodnichenko, a non-linear VAR in which output responses may vary according to the state of the economy (recession or expansion), thus assuming a less general type of time--variation than here, is in principle better suited to address the issue.

Chart 2

TIME-PROFILE OF OUTPUT RESPONSES IN A STRUCTURAL VAR WITH VARIABLE COEFFICIENTS



Source: Author's calculations.

Nota: Impulse-response functions for policy shocks in the structural VAR model described in section 3 in a specification with time--varying coefficients (1973:3-2011:3) simulated by Bayesian methods. The shaded areas show the NBER recessions.

during the 2008-09 recession and, in fact, there is a fall in the quarters following its end (during which the Federal Reserve has kept the interest rate virtually unchanged).

Comparing with the responses shown in Chart 1 for the fixed-coefficient model, the evidence is generally consistent in that it indicates an attenuation of the effect on output over time for the three policy variables. Moreover, the two specifications point to a weakening in the responses to fiscal policy shocks since mid-90s and monetary policy shocks around 1980. However, the amount of time variation captured by the variable-coefficient specification is much more modest. In particular, budgetary multipliers maintain conventional signs throughout, and the impact of monetary innovations since 1980 fluctuates less. These results suggest that the fixed-coefficient model may exacerbate the measured temporal variability, lacking the flexibility to accommodate new observations in a «smoothed» fashion. The peaks observed in Chart 1 for responses at certain dates appear to support this conclusion. Nevertheless, the smaller variation of responses in the variable-coefficient model also raises the question of the influence on this outcome of the coefficient volatility assumed in the prior distributions. Simulations increasing that volatility produce median responses which, although less flattened, especially in the case of monetary policy, lead to the same qualitative conclusions. The main difference concerns the confidence bands which extend quite substantially. Thus, the evidence seems to be fairly robust with regard to volatility assumed a priori.

However, other specifications of temporal variation in the VAR coefficients are possible, for example, paths differing from a random walk. It is thus needed more experience with these models before firm conclusions are drawn.

6. Conclusions

This paper presents evidence on temporal variation in the effectiveness of monetary and fiscal policies on the basis of a structural VAR model with joint identification of the respective shocks. The exercise is based on the estimation of a specification with fixed coefficients, using rolling samples, and the simulation of a specification with variable coefficients. In both cases there is a weakening of the role of policies, but this tendency is more pronounced in the specification with fixed coefficients. Indeed, the latter points to the existence of fiscal multipliers with non-conventional signs since mid-90s, in the case of the acquisition of goods and services, and at the end of the sampling period in the case of net taxes. Moreover, the results indicate a virtual absence of a stabilizing role of net taxes in the 2008-09 recession, in stark contrast with the role played in previous protracted recessions. As regards monetary policy, after a weakening of its effectiveness by 1980, the results suggest a large fluctuation up to the present. However, the estimation based on rolling samples seems to exaggerate the temporal variation of responses, relative to a formal modeling with variable coefficients. In the latter case, the output response to monetary policy shocks after 1980 is smoother and features a quasi-stabilization. The fiscal multipliers maintain conventional signs, but get smaller over time and, in particular, their values contradict the assumption of a particularly effective fiscal policy in the current context.

An improved conduct of monetary policy is among the explanations that have been advanced for the waning of output responses to policy shocks, including to monetary policy shocks themselves comparing the periods before and after 1980 (see Boivin *et al.*, 2010). Similarly, the most immediate explanation for the effectiveness loss of fiscal policy would be a greater efficiency by the Federal Reserve in conducting stabilization actions. But this same argument would imply an upsurge of the effects of fiscal policy in the very recent period, which is not supported by the findings of this study. Another possible justification (which used to be put forward in the context of the «Great Moderation») refers to the fact that financial innovation should allow individuals to better smooth their income and, more generally, to hedge against fluctuations in budget aggregates and interest rates. However, this assumption clearly changed in recent years in the wake of the financial crisis, again justifying a resurgence of policy effectiveness.

In this context, it can be also mentioned the traditional Keynesian hypothesis that an increase in trade openess entails a reduction of budgetary multipliers. It should be noted, finally, the possibility that agents' perception towards public finance sustainability can change the effects of fiscal policy (and in extreme cases lead to a change in the signs of multipliers - the so-called «expansionary fiscal contraction» hypothesis). This is an area where more empirical research is needed, in order to identify the factors underlying the changes in output responses. Such an investigation is particulary difficult as it requires, in general, the specification of non-linear models, whose estimation involves non-conventional methods and relatively heavy simulation techniques.

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