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Bülent Güloğlu
Recep Kök
Ercan Uygur
Özhan Üzümcüoğlu
Erinç Yeldan

Editor's Introduction

Let me start with the news that our *Ekonomi-tek* is now listed at RePEc (Research Papers in Economics). This means that all previous issues are available there, and the articles within them can be downloaded. The website address of RePEc is: **http://ideas.repec.org/s/tek/journl.html**

In this second issue of Volume Two of *Ekonomi-tek*, we present four stimulating papers. Two of these, the second and third, first gained exposure at the Third International Conference on Economics of the Turkish Economic Association (ICE-TEA) in November 2012.

The first paper is by David Colander of Middlebury College, who is well known worldwide for his work on the state and teaching of economics. In this paper, he asks two important—and provocative—questions for Turkish economists: What should Turkish economists do, and how should they do it? The current situation is generally one where most economists find themselves pushed to do research that ends up serving little purpose to society. Publication has become an end in itself, not a springboard for deeper thinking about vital concerns or solving economic problems. In a similar manner, much of the research done by Turkish economists helps Turkey far less than it should, and too often it is done merely to get published and not to most effectively address the country's economic challenges.

Admittedly, any discussion of Turkey's geographically and culturally defined economic problems holds little interest for the typical global economist. Yet, for Turkish economists, working toward the resolution of these problems should be a central goal of their research efforts. Unfortunately, efforts of this sort on the part of Turkish economists is discouraged by the tendency of many Turkish universities to judge the quality of their research according to the standard of a global ranking metric. Thus, Turkish economists are left with scant incentive to direct their attention to Turkish economic problems.

Colander offers two solutions. The first is for Turkish universities to develop a new journal-ranking method focusing on a particular research niche, and to use that ranking method to evaluate economic research. The second is a voucher system that would give demanders of Turkish economic research more direct control over what research is done. This system would ensure that

the research undertaken by Turkish economists is more closely aligned with the needs of Turkish society.

The second paper in this issue is by Meltem Aran of Development Analytics, whose research focuses on poverty and the impact of government social policies. Drawing on a specialized household-level survey, she shows how the Turkish macro-shock from the 2008-09 crisis translated into declines in income and welfare. In reaction to this income shock, households cut down on their spending on food either by substituting cheaper food products or, more directly, by reducing their consumption of food. About 71% of the households in the survey sample substituted cheaper food items, 57% directly decreased the amount of food consumed, and 24% reduced the amount of food provided to children.

Using several econometric techniques, including probit and instrumental-variables probit, Aran estimates the overall impact of the income shock on household welfare and consumption. Interestingly, the author finds that education and health-care expenditures of the households emerged largely unscathed. Urban households and households with lower level of assets have a higher probability of reducing food consumption. On the basis of her findings, Aran makes certain policy suggestions aimed at protecting the poor from economic crises.

In the third paper, Hamza Polattimur, from the Technical University of Dortmund, provides a rationale for housing subsidies in a model where there are market imperfections and private loans are not enforceable and have to be collateralized by housing. In the household sector of the model, there are two types of agents, patient and impatient ones, who differ in their discount factors. For the former, the collateral constraint is irrelevant, but for the latter it is important. Exogenous government expenditures are financed by a housing property tax and a labor income tax. Housing tax rates are different for the two types of agents; the patient households always own larger houses than the impatient ones and should therefore be taxed at higher rates than the impatient and wealth-poor agents.

The result can be interpreted as endorsing a policy of redistribution from wealthier patient households owning larger houses to poorer impatient households owning smaller houses. Polattimur also considers a representative-agent version of the model as a reference case. Here, the author aims to explain the effect of a durable good, namely a house, on the optimal fiscal policy as compared to standard models. The results indicate that goods with lower elasticities should be taxed at a higher rate. The author also urges governments to continue providing housing subsidies.

The fourth paper is by Friedrich Schneider, of Johannes Kepler University of Linz, who is renowned as an authority on shadow/unregistered economies. In this paper, he is concerned with the definition, measurement, driving forces, and the size and progression over time of the shadow economies of Turkey and other OECD countries. The following are some observations:

(1) The size of the shadow economy as a proportion of GDP has contracted in all OECD countries, including Turkey. The unweighted average of this variable across the 36 OECD countries declined from 21.0% in 2003 to 17.1% in 2013 (forecast). The decrease in Turkey is proportionally the same, from 32.2% to 26.5%.

(2) The size of the shadow economy increased in all countries in 2009 and 2010 due to the global crisis, but dropped in 2012 and 2013, due to the recovery.

(3) The eastern and southern European countries have larger shadow economies than the western and northern European ones. The average of the shadow economies of five developed non-European OECD countries (Australia, Canada, Japan, New Zealand, and the United States) is smaller than the average of the European ones. Switzerland has the smallest shadow economy in Europe.

(4) The larger the size of a given country's shadow economy, the higher its level of tax evasion will be.

We hope to continue to provide you with worthwhile papers on economics in the coming issues.

Ercan Uygur
Editor
Ekonomi-tek

Editörün Sunuşu

Ekonomi-tek dergimizin RePEc'te (Research Papers in Economics) listelenmeye başladığı haberini vermekle başlamak istiyorum. Dergimizin tüm sayıları burada bulunabilir ve tüm makaleler indirilip yüklenebilir. RePEc web sitesi adresi: **http://ideas.repec.org/s/tek/journl.html**

Ekonomi-tek'in İkinci Cildinin bu ikinci sayısında dört ilginç makale sunuyoruz. Bunlardan ikinci ve üçüncü makaleler Türkiye Ekonomi Kurumu'nun Kasım 2012'de yapılan Üçüncü Uluslararası Ekonomi Konferansında (UEK-TEK) sunulmuştu.

Birinci makalenin yazarı Middlebury College'dan ve iktisadın durumu ve iktisat eğitimi konusundaki çalışmalarıyla dünyaca ünlü David Colander'dır. Bu makalede Türkiye'deki iktisatçılar için önemli - ve tartışma yaratacak - iki soru sormaktadır; Türk iktisatçılar ne yapmalı ve nasıl yapmalıdır? Günümüzde genel olarak iktisatçıların büyük bölümü topluma katkısı sınırlı olan araştırmalar yapmaya yönelmektedir. Yayın yapmak nihai amaç haline gelmiştir, önemli konular hakkında düşünceleri derinleştirmek veya ekonomik sorunlara çözüm bulmak asıl amaç olmaktan çıkmıştır. Benzer biçimde, Türk iktisatçıların yaptıkları araştırmaların Türkiye'ye çok sınırlı katkısı; bunlar da genellikle yayın içindirler ve ülkenin zorluklarını etkin biçimde gidermek için üretilmemişlerdir.

Kabul etmek gerekir ki, Türkiye'nin coğrafi ve kültürel olarak tanımlanmış ekonomik sorunlarını tartışmak tipik küresel iktisatçının ilgi alanı içinde çok küçük bir yer tutar. Halbuki bu sorunların çözümüne yönelik çalışmalar, Türk iktisatçılarının araştırma çabalarının temel amacı olmalıdır. Ne yazık ki, Türk iktisatçılarının bu tür çabaları, yapılan ekonomik araştırmaların kalitesini değerlendiren Türk üniversitelerinin küresel sıralama ölçütü standardını aynen kullanma eğilimleri nedeniyle engellenmektedir. Böylece Türk iktisatçılarının dikkatlerini Türkiye'nin ekonomik sorunlarına yöneltmek için teşvik ve dürtü yetersiz kalmaktadır.

Colander, iki çözüm yolu önermektedir. Birincisi, Türk üniversitelerinin özelliği olan araştırmalara odaklanan yeni bir dergi sıralama yöntemi geliştirmesi ve bu yöntemi araştırmaların değerlendirilmesinde kullanmasıdır. İkincisi, Türkiye araştırmalarını talep edenlerin ekonomik araştırmalar üzerinde daha doğrudan kontrolü olan bir belge/istek sistemine geçilmesidir. Bu sistem,

Türk iktisatçılar tarafından yapılan araştırmaları, Türk toplumunun iktisatçılardan istedikleriyle/beklediklerinden çok daha uyumlu hale getirecektir.

Bu sayıdaki ikinci makale, fakirlik ve sosyal politikaların etkileri konusunda yoğunlaşan araştırmalar yapan Development Analytics'den Meltem Aran'ındır. Özel bir hanehelkı anketinin verilerine dayanarak yazar, bu makalede, Türkiye'deki 2008-09 bunalımının getirdiği makro-şok'un gelir ve refah üzerinde nasıl bir azaltıcı etki yaptığını göstermektedir. Bu şoka tepki olarak hanehalkı, daha ucuz gıda ürünleri ile ikame ederek ve/veya doğrudan gıda tüketimini kısarak gıda harcamalarını düşürmüştür. Anket örnekleminde yer alan hanehalkının yaklaşık %71'i daha düşük fiyatlı gıda maddeleri ile ikame etmiş, %57'si doğrudan gıda tüketim miktarını düşürmüş ve %24'ü çocuklara verilen gıdayı azaltmıştır.

Probit ve araç değişkenli probit dahil olmak üzere değişik ekonometrik yöntemler kullanan Aran, gelir şokunun hanehalkı refahı ve tüketimi üzerindeki toplam etkisini tahmin etmiştir. İlginçtir, yazar, hanehalkının eğitim ve sağlık harcamalarının şoktan genellikle etkilenmediğini bulmuştur. Şehirlerdeki ve varlıkları daha düşük olan hanehalklarının gıda tüketimlerini azaltma olasılığı daha yüksektir. Bulgularına dayanarak Aran, ekonomik bunalımlarda fakirleri korumak üzere bazı politika önerileri getirmiştir.

Üçüncü makalede, Technical University of Dortmund'dan Hamza Polattimur, piyasa aksaklıklarının olduğu ve özel krediler için konutların teminat gösterildiği bir model içinde konut subvansiyonunun gerekliliğini ve gerekçesini göstermektedir. Modelin konut sektöründe, iskonto oranlarıyla farklılık gösteren, biri sabırlı, diğeri sabırsız iki tür karar alıcı vardır. Sabırlı olan için teminat gereksizdir, ancak sabırsız olan için önemlidir. Hükümet harcamaları dışsaldır ve konut mülkiyeti vergisi ve ücret geliri vergisi ile karşılanmaktadır. Konut vergisi iki tür karar alıcı için farklıdır; sabırlı hanehalkları sabırsızlara göre daha büyük konutlara sahiptirler ve dolayısıyla sabırsız ve daha düşük servetlilere göre daha yüksek oranda vergi vermelidirler.

Bu sonuç, daha çok serveti ve daha büyük evi olan sabırlı hanehalklarından, daha az serveti ve daha küçük evi olan sabırsızlara doğru gelirin yeniden dağılımını öngören vergi politikasının onaylanması şeklinde yorumlanabilir. Polattimur ayrıca, karşılaştırma yapmak üzere, bir temsili karar alıcı modelini de dikkate almaktadır. Burada yazar, standart model ile karşılaştırmak üzere, konut ile temsil edilen dayanıklı tüketim malının en iyi vergi politikasına etkisini açıklamayı amaçlamaktadır. Elde edilen sonuçlara göre, daha düşük esnekliği olan mallar daha yüksek oranda vergilenmelidir. Yazar ayrıca hükümetleri, konut subvansiyonlarının sürmesi gerektiği konusunda uyarmaktadır.

Dördüncü makale, gölge/kayıtdışı ekonomiler konusunda otorite olarak bilinen, Johannes Kepler University of Linz'den Friedrich Schneider'indir. Bu makalede yazar, Türkiye'de ve diğer OECD ülkelerinde kayıtdışı ekonominin tanımı, ölçülmesi, etkenleri, büyüklüğü ve zaman içinde gelişmesi ile ilgilenmiştir. Aşağıdakiler bu makaleden bazı gözlemlerdir:

(1) GSYH'nın oranı olarak kayıtdışı ekonominin büyüklüğü, Türkiye dahil tüm OECD ülkelerinde gerilemiştir. Bu değişkenin 36 OECD üyesi için ağırlıksız ortalaması 2003'te %21.0'dan, 2013'te (öngörü) %17.1'e düşmüştür. Türkiye'deki düşme, %32.2'den %26.5'e, oransal olarak aynıdır.

(2) Kayıtdışı ekonominin büyüklüğü küresel bunalım nedeniyle 2009 ve 2010'da tüm ülkelerde artmış, fakat 2012 ve 2013'te ekonomik iyileşme nedeniyle düşmüştür.

(3) Kayıtdışı ekonominin büyüklüğü, doğu ve güney Avrupa ülkelerinde, batı ve kuzey Avrupa ülkelerine göre, daha yüksektir. Avrupalı olmayan beş gelişmiş ülkedeki (ABD, Avustralya, Japonya, Kanada, Yeni Zelanda) ortalama kayıtdışı ekonomi büyüklüğü, Avrupa ortalamasına göre oldukça düşüktür. Avrupa'da en küçük kayıtdışı ekonomi İsviçre'dedir.

(4) Bir ülkenin kayıtdışı ekonomi oranı büyüdükçe, o ülkede vergi kaçırma oranı da daha yüksek olacaktır.

Sizlere gelecek sayılarda da dikkate değer ekonomi makaleleri sunmayı umut ediyoruz.

Ercan Uygur
Editör
Ekonomi-tek

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What Should Turkish Economists Do and How Should They Do It?

David Colander[*]

Abstract

This paper argues that the research Turkish economists do helps Turkey far less than it should, and too often it is done merely to get published and not to most effectively solve the problems that Turkey faces. It suggests two ways of dealing with such problems: one is for Turkish universities to develop a new journal-ranking method focusing on a particular research niche, and to use that ranking to evaluate research; the second is a voucher system that would give Turkish demanders of Turkish economic research more direct control over what research is done. Each proposal would change the incentive structure confronting Turkish economists, making what they want to do much more consistent with what Turkish society wants them to do.

JEL codes: A11, A14, A23, B40, D02

Keywords: Incentives, research, journal publication, ranking, metrics, research niche

[*] College Professor, Middlebury College, USA. Colander@Middlebury.edu

1. Introduction

Let me begin this paper with my pat answers to the title questions: What should Turkish economists do? Whatever they want to do, as long as it is consistent with surviving within the institutional structure. How should they do it? With gusto. Were I to leave it like that, this would be a very short paper. But I won't, since academic papers are supposed to be longer than three lines.

2. What Should Turkish Economists Do?

Expanding upon the first answer, I will state that I am a strong believer in the principle that everyone should do whatever he wants to do, but with the qualifying phrase, "as long as it is consistent with surviving within the institutional structure." It is the institutional structure that determines effective wants, and one can only understand what goes on in a field by understanding the institutional structure that underlies it. The central policymaking action takes place in the evolution of norms and institutions and the incentives embodied in them, not in the abstract notion of incentives that most academic economic-policy discussions revolve around.

Because I believe norms and institutional structures are key to determining what we do, I disagree with the way standard historians of science portray science as a search for the truth in a setting devoid of institutions. That doesn't describe the scientists I know, including me.

Finding the truth is only one element in most scientists' institutionally constrained utility function. For academics, finding and holding a well-paying position generally ranks far above "finding the truth" in their effective utility function. (If it doesn't, they will probably not remain academics for long.) Even those who have tenure or secure academic jobs still have academic politics to worry about, which strongly influences the decisions they make. As Stephen Wolfram put it, "My view about doing basic science is that if you have no choice, then getting paid by a university is a fine thing to do. If you have a choice, there are a lot better ways to live."

3. Institutionally Embedded Incentives in the Economics Profession

In my view, the incentives embedded in existing academic institutions to publish in "appropriate journals" push a large majority of economists to structure and report their research in a way that serves little purpose to society. Somehow the publications that are considerd "appropriately quality-

weighted" economic journals are supposed to equate with more economic knowledge, but that just isn't so. Far too often, the primary role of publications in economics is to meet research requirements, as well as advance the person doing the research, not advance knowledge. Publication has become an end in itself, not an input into deep thinking about subjects or solving economic problems. The cost of this "end-in-itself" research is enormous; half, or more, of most university professors' time is devoted to research. So the nature and usefulness of academic research represent a leading public-policy question.[1]

I am not arguing against research.[2] Appropriate research does not detract; it contributes to teaching. The question I am asking is: what is appropriate research? I am against the practice of diverse types of research being forced into a one-dimensional ranking that does not capture the many purposes of research. That ranking metric has undermined the research activities of a substantial proportion of the economics profession. It has led economists of all stripes to judge research in reference to a one-dimensional global ranking system that doesn't take account of the multifaceted nature of research. For example, in one university economics program's ranking metrics, one paper in a top journal can be the equivalent of 200 articles in a journal ranked 30 or 50 journals lower, and 1,000 articles in a journal ranked 100 levels lower. That may be an appropriate ranking for a certain type of research, but it is not valid for most research.

The actual rankings are set by the particular programs, meaning that what is considered "acceptable" differs from school to school. At the 20 university programs that regard themselves as contenders for Top Five status, acceptable journals are those in the top five to (possibly) 10 globally, as measured by one of the standard journal-ranking metrics. As one moves down the rankings of economics programs, the journal acceptability increases, but the general ranking of journals does not.

There are well over 1,000 journals in economics, so publishing in one of them is relatively easy for a serious researcher who takes the time to under-

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[1] I have made these arguments about research in a variety of forums. See, for example, Colander (2010) and Colander and Nopo (2011).

[2] My focus in this article is on research. There are also incentives to be an adequate teacher, but at most US programs, the teaching aspect of the job is overshadowed by the research aspect. Academic economists see themselves as economic researchers first. In fact, at many programs, being too devoted to teaching is seen as a negative—it means that the economist does not have a sufficiently high focus on research. Thus, at some universities, a teaching award is called the "Kiss of Death" award by students, since it suggests that the person had spent too much time on his or her teaching.

stand the publication process. To the degree that the journals have the same focus, a one-dimensional ranking is reasonable. But all journals do not have the same focus. A journal devoted to a special area—the history of thought, Turkish economic problems, economic education—or to a different audience, such as a multidisciplinary journal or a journal devoted to a more general audience, will not be ranked highly in the standard rankings; yet it might include superb research and be much more helpful to readers than research in the so-called top journals. My point is that the proper ranking of journals depends heavily on the reader's interest.

For non-economists, for individuals intent on solving particular problems, and for policymakers, lower-ranked journal articles are often far more valuable than higher-ranked ones because the information in the former often focuses on a relevant problem. For example, this paper is, I suspect, much more useful to individuals interested in the Turkish economics profession than are just about all of the papers published in the Top Five economics journals.

This institutional reality of US economic programs is, in my view, crazy. With all programs using a single dimensional metric for measuring "research output," economists are forced to compete on the basis of that metric, foreclosing the development of many major contributions economists could be making to society; it also represents an enormous waste of research effort on the part of the profession, where a sameness among programs leads to a situation of far too little specialization. It is the equivalent of all countries producing the same good, and thus not taking advantage of comparative advantages.

Here are two examples in the US of what I mean by lack of specialization.

Case Study #1 is a university economics program in the heart of oil country that ranks in the bottom third of such departments in US academia. This school not only does not specialize in oil and resource economics; it does not have a single oil specialist economist. The program has a hard time recruiting top students and struggles to place its graduates. If this program specialized in oil economics and saw its primary job as training oil economists, it could be close to the top in its niche—oil and resource economics. It would be able to place its graduating students in positions with probably double the salaries that their counterparts of today are receiving. Furthermore, it could recruit students of the highest caliber whose goal would be to specialize in oil economics. In its niche, it would outshine Harvard, and anyone looking for an oil economist would seek out its graduates, not those of the Top Ten. Also, it could afford to be much more selective in accepting students, since it would be offering something unique.

Case Study #2 is a program at a university with a prestigious medical school in a large US city. It also ranks in the bottom third of US economics programs according to the standard one-dimensional journal metric. It, too, has trouble both attracting top students and finding jobs for them after they graduate. Serendipitously, it also boasts some of the top economists in the field of economics education. While it deploys the economists on its staff in both of the specialities of economics education and medical economics, the program's official view of health is as a component of micro-economics and not as its special niche.[3] Advancement depends on publications ranked by the standard journal metric. This discourages its professors from doing research on economics education, since such research is generally only published in specialty journals devoted to that particular topic. Likewise, academics steer clear of research into applied areas of health, where economics is blended with other specialties to arrive at an interdisciplinary approach to a problem. Neither type of research is seen as promising, since neither will lead to being published in sufficiently highly ranked publications, which are spelled out in the one-dimensional journal-article ranking system that this university adheres to (as does almost every other university economics faculty in the US). (I have even known some economics programs not to give much weight to an article that appeared in *Lancet* or *Science*, since they are not ranked on the normal economics-journal ranking metric!)

If this program developed its own ranking in those two areas—health-care economics and the economics of education—and judged its success in terms of how its faculty did in this ranking, it could emerge on the national scene as a leader in grooming future professors to teach undergraduates in these specialties and in providing health economists to government, industry, and medical schools. It might even turn out to be one of the top five programs globally in its niche. Instead, it languishes as a wannabe program that doesn't have one chance in a million of moving up.

The issue is not only one of a needed change in specialization or focus; it is what these programs see themselves as doing, whom they hire, and the metric by which they measure success. If they occupied a niche within the profession, as I am suggesting they should, they would not be so eager to hire their professors from a Top Five or even a Top 20 program, given that such talent would not be a good match for the specialized needs of the university owning that niche. Instead, they would hire professors from those programs that ranked highest in the research appropriate for their niche. The economics pro-

[3] Happily it, like most non-top US programs, does not even try to extend its research coverage to macro-economics, since what is currently taught as macro is of little use to an economist who does not specialize in a very narrow type of macro-economic modeling issues.

gram in Case Study #1 might even hire economists working as oil economists at oil companies, and Case Study #2 might turn to economists currently employed as health economists or as teachers of economics.

Forsaking the counterproductive custom of one-dimensional ranking (which condemns university economics departments to the bottom tier) in favor of a system where each program carves out a niche for itself would give rise to a veritable panoply of overlapping rankings reflecting the multiplicity of wide-ranging areas of national life where economics plays a role. Economics as a profession would then enter a new age, with its students getting a more relevant education and its professors contributing more to society.

4. What Does the Above Discussion Have to Do With Turkish Economists?

So what does the above discussion have to do with Turkish economists? In my view, a lot. Turkish (and other non-US) universities are in an even more difficult place than the non-top 20 US economics programs. Their chances of doing well in a one-dimensional global economics-ranking metric are minimal. First, they face the problem of language—it is more challenging to compete in a second language, and the global economics metric is all in English. Second, there is the distraction caused by side-talk. The research that shows up in articles generally results from informal discussions that have occurred among researchers interested in the particular problem. Economists who are not part of that informal discussion, which includes almost all Turkish economists in the areas and types of research that the global economic metric focuses on, have little chance of publishing in a highly ranked general journal.

A third problem is the existence of differing research foci. Turkey is a developing country but with particular economic problems unique to it alone. Unfortunately, the discussion of Turkey's specific geographically and culturally defined problems holds little interest for the typical global economist. But the solutions to such problems are of enormous interest to Turkish policymakers and the Turkish people. Working toward the resolution of such malfunctions and inefficiences should be a central goal of Turkish economists' research. The stumbling block to realizing this goal, however, is the tendency of many Turkish universities to judge the quality of their economic research by the standard of a global ranking metric; thus, Turkish economists have scant incentive to direct their attention to Turkish economic problems: no matter how good such research is, it has less chance of being published in a high-ranking journal than similar research with a US focus.

With these three negatives forming a backdrop, how can one expect Turkish economists to perform their research with the gusto, or enthusiasm and energy, that I think is essential for high-quality output, whether in research or in teaching. It is inherently unfair to subject a young Turkish economist's research to the "judgment" of a global metric that is highly biased against anyone outside the top 20 US-based programs. In fact, to do so is a recipe for creating a cynical economist who may persist in doing research but has lost the gusto that leads to ground-breaking research and remarkable contributions far beyond what the incentives call for.

5. How to Make Turkish Economic Research Valuable to Turkey

University education is a national priority in Turkey; regions in Turkey know this, and so each province pressures the national government to provide it with its own campus. Responding to this phenomenon, the Turkish government has been establishing new state universities in all 81 provincial capitals; indeed, as of 2013, there are now more state universities than provincial capitals.

Each regional university has its own economics program, each of which should be a catalyst for economic development and better governance in its location. However, this is seldom the case. The researchers' focus is usually not on that region's specific inadequacies or bottlenecks, nor is it on the type of hands-on, nitty-gritty research that is required to actually solve a problem. Why? Because such research is not publishable in the journals that the researchers believe they are required to publish in if they are to advance. Unless those university economics programs emphasize the development of a research niche specifically tailored to the area they are in, and create a ranking metric that reflects that niche, they will add little of value to the local area and may even end up doing harm in the long run. Such harm will be the indirect result of having directed the most intelligent academics to pay attention to something other than that region's unique problems. Hence, I suggest a basic rule of reasonable research focus: to keep economists doing their research with gusto, every program should define its niche sufficiently narrowly so that it has a shot at becoming number one in that specialty area of economics.

What type of niches can Turkish economics programs carve out for themselves? Some, in tourist areas, might delve into the economic aspects of Islamic tourism; their goal would be to have the best researchers in Islamic tourism in the world. Others, in resource-rich locales, could make a name for themselves in certain resource-related studies. Still others associated with

finance could bring modern economics concepts to bear on Islamic finance. Other possibilities are linkages with local public finance and governance issues. Much of this work would be transdisciplinary, since real-world problems do not follow disciplinary lines. It would also be readable and understandable by policymakers, reflecting the needs of the region where the university was located.

To clarify what I am suggesting: establishing a niche is much more than a university economics department's having a research focus on an area. *A research niche requires an advancement metric that was inspired by that niche;* research is defined as to whether it is appropriate to that niche. Known for its research niche, a given university will be far less likely to recruit professors from programs that do not offer courses in that area of study. Rather, each program will fit in with other economics programs around the world that have similarly defined niches; thus, a Turkish university focusing on tourism might hire a graduate from a Chinese university similarly focused, just as a Chinese university might hire a graduate from a Turkish university. Hires might also cross disciplinary boundaries.

As each program develops its own ranking of publications most in tune with its research niche, there will no longer be a one-dimensional global ranking of publications. Instead, there will be many non-comparable rankings. [4] This means that an article in a narrowly focused journal covering the area the university has chosen as its research niche will likely count as high, or higher, than one in a publication that ranks high in the current global publication rankings.

6. An Alternative Problem-Solving Metric

Unfortunately, creating a niche approach to research will be politically difficult, thus calling for an alternative proposal that can complement, and encourage, such an approach. In fact, it is a proposal that I put forth in *The Making of a European Economist* (Colander, 2009).In essence, the idea is to make the research portion of a professor's pay dependent on his meeting a market-determined metric rather than a journal-article research metric.

[4] I am not saying that a program would not hire some general economists who are outside the program's niche or that they would not be interested in a top globally ranked economist should that economist be interested in being there. For example, if Dani Rodrik wanted to teach at a particular university, any economics department in the world, regardless of its research niche, would be crazy not to find a position for him. But those hires would be the exception.

This would require the establishment of a market-based system that builds an output metric into the funding mechanism for a research project, thereby doing away with the need for a system-wide post-research formal output metric. Specifically, the system would revolve around research vouchers, which I will call TRUs (Turkish Research Units), denominated in Turkish liras. Rather than paying professors to do some unspecified research, as is the current practice, the Turkish state would only pay professors for teaching, thus freeing up that portion of the university's funding that formerly underwrote research.

The state and other Turkish funding agencies for universities would then use those funds to create TRUs to distribute either directly or indirectly to the demanders of Turkish economics research in an amount equal to the research funding for salaries that they are already providing to the university. So if 50% of an academic economist's time is to be devoted to research, then 50% of his pay will not be supplied by the state directly to his university, but instead will be handed to demanders of his research. In turn, these "customers" would transfer these TRUs to the professors upon completion of a research project they had chosen to support. Accordingly, in order to be paid the research portion of his remuneration, the researcher would have to "earn" TRUs of that amount. These research projects bankrolled by such TRUs could originate with the professor or with the funding agency. The professor would then pass on the TRUs he or she earns to the university as the measure of the research's output, whereupon the university would convey to the professor the research portion of his total compensation.

This market-based research solution is relatively simple, modifying as it does the funding system of universities so that it directly incorporates an incentive to do research. If a professor carries out the research that funding agencies are willing to support, he or she gets compensated with the research portion of the salary; if one doesn't do "fundable" research, one doesn't get paid the research portion of his salary. In that way, the market-based research system provides a "market" answer to the incentive problem that is both more and less radical than the "impose a quantitative metric" rule that is currently being followed everywhere.[5]

[5] The professors to whom I have presented this proposal have not been enthusiastic about it. This is not surprising. Few individuals like to submit themselves to the market, especially if they can receive payment without undergoing the ordeal of doing so, as they currently can.

7. Some Specifics of the Proposal

It should be obvious to the reader that the funding agencies' role in guiding research would be greatly expanded under this scenario. They would influence academic research by their choice of where to direct the TRUs. If the funding agencies want to fund what I call scientific hands-off research, which is essentially the research that professors now do, they would provide the TRUs to scientific foundations, whose role would be much more prominent under this system. These scientific foundations would not only back supplemental research funds, as they currently often do; they would also subsidize the standard salary for the research component of a professor's work. Thus, any funded scientific hands-off research that is subsidized will have to make it through an initial scientific peer-review panel that will decide if that research is worthwhile. Admittedly, this places an initial hurdle in the path of scientific research, but successful negotiation of it is likely to boost the possible usefulness of the research. I would expect about 20% of the TRUs to go for such scientific research of the type now taking place.

I would expect another 20% of the research funding to support what I call teaching-oriented research. This is not scientific research, but is research that would benefit teaching. Work in economic history, the history of economic thought, institutional economics involving case studies, general policy work, and work involving discussions of broader ideas within economics all fall within this category. This research is not science, but it enriches teaching, and one would prefer teaching-oriented professors to apply themselves to this type of research. Thus, I would see funders establishing Teaching Foundations that would be given TRUs to allocate through a competitive process in the same way that the scientific foundations allocate their TRUs. There is much of this teaching-oriented research already going on in Turkey, although it is being squeezed out by the focus on a quality-weighted journal-article research metric. This proposal would provide a channel for it to receive funding if the funding agencies believed that it had merit.

Both of the above types of research are currently being done, and if transferring the funding structure of existing research were the only result of such a program, it would serve little purpose. My strong suspicion is that when the Turkish government is presented with the "academic research question" in this manner, it wıll not choose to fund anywhere near as much scientific hands-off research and teaching-oriented research as is presently the case. Instead, it will probably change the nature of the research it pays for by bypassing scientific agencies that support hands-off scientific research and teaching entities that fund teaching-oriented research in favor of applied-

policy non-profit agencies, NGOs, national government agencies, local government agencies, and possibly new emerging companies, all of which could use the advice of an economist. If this happens, the nature of the research chosen by academic Turkish economists would change significantly, becoming much more of the of the hands-on applied type that benefits the community where the university is located. Specifically, I foresee approximately 60% of the funding going toward hands-on research, i.e., where the university economists help the local community to solve problems with an economic component.

How would this be done in practice? The groups receiving these TRUs would post their "research jobs" on a website devoted to matching the demand for research with researchers. They could either post the number of TRUs they are willing to pay for the research, or they could put the research out for bid, but ultimately a match-up would result. The research could be for general consulting, or for a specific project, such as setting up a study or simply reviewing a study that has already been done. Agencies given TRUs might be required to post performance evaluations of the economists' efforts with the funding agencies. These evaluations could be published on the website, or simply provided to other agencies that are casting about for suitable future researchers.

8. Conclusion

This has not been a run-of-the-mill economics article. It involves far too much conjecture and broad thinking than is appropriate for a usual journal article. Instead, it has been an exploration of a two-pronged problem—namely, the research carried out by Turkish economists helps Turkey far less than it should, and too often it is done to get published and not to most effectively solve the country's problems.

I have offered two ways of dealing with these problems—one is for Turkish universities to develop a new journal-ranking method focusing on a particular research niche, and to use that ranking to evaluate research; the second is a voucher system that would give Turkish demanders of Turkish economic research more direct control over what research is done. Because each proposal would change the incentive structure presented to Turkish economists, each wouldl affect which path Turkish economists decide to pursue. They would make what Turkish economists want to do much more consistent with what Turkish society wants them to do. And by making the two more consistent, it could lead Turkish economists to do their research with the gusto that should accompany it.

I have little expectation that either program will be implemented. But even if that is so, I believe that considering them will generate needed discussion and lead to proposals that adapt the ideas behind them into proposals that fit the specific Turkish institutional structure. I hope this article gives rise to a variety of other articles about variations on these proposals, and that Ekonomi-tek decides on practical incentive-compatible academic-research proposals as one of its research niches, becoming in the process the go-to journal for university economics programs all over the world who may be considering that issue.

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Welfare Impact of the Global Financial Crisis of 2008-2009 on Turkish Households

Meltem A. Aran, Ph.D.[*]

Abstract

This paper looks at how the macro-shock from the 2008 financial crisis has translated into income and welfare shocks in the form of reduced earnings and consumption at the household level in Turkey. Using a specialized household level Welfare Monitoring Survey implemented in May-June 2009 in seven Turkish provinces, the paper first establishes a link between the province-level shock and the changes in earnings at the household level. Secondly, using an instrumental-variables strategy, it establishes the link between the earnings reduction and changes in consumption. The main findings in the paper are that informally employed workers, and those with lower levels of education, were most likely to be hurt by the crisis. In terms of human-development investments at the household level, the paper finds that food expenditures acted as the main adjustment mechanism in the face of the income shock, while education and health expenditures remained relatively stable. The probability of reducing food consumption (and the amount of food provided to children) was highest among the poor that initially had low levels of household assets.

JEL Codes: D10, D12, D31, I30

Keywords: Global financial crisis, income shock, coping strategies, Turkey.

[*] Development Analytics, 31 Mektep Sokak Emirgan Istanbul, meltem.aran@developmentanalytics.org

1. Introduction

While the center of the global financial crisis of 2008-09 was the developed world, many developing countries have also been impacted by the aftershock of the crisis. At the macro level, the impact of the crisis can be measured by increases in the unemployment numbers and reductions in GDP growth. But how has the macro-shock translated into income shocks at the household level and then consequently to changes in welfare in terms of food and non-food consumption as well as investments in human development, such as education and health expenditures, in different parts of the developing world? This is a critical question to answer for economists in order to fully understand how households in the developing world have ultimately been impacted by this large-scale aggregate blow.

Several papers have been written, based on data from previous crises, focusing on household coping mechanisms and consumption responses to income shocks. One study by McKenzie (2003) uses Mexican household surveys to examine the micro-impact of the 1995 peso crisis. Using data from four years of household surveys between 1992 and 1998, the paper examines the impact of the crisis across various strata. The author makes non-parametric comparisons (Welch tests) of the equality of means for mean weekly labor hours, household structure, and fertility levels, as well as school attendance of children across the years, and finds that consumption fell dramatically in this period, due to households' inability to fully smooth the shocks to their income. At the same time, household structure did not change dramatically over the crisis period, nor was the coping strategy of adding more household members to the labor force widely used. The author links this to weak labor demand through the crisis period and finds that the reduction in labor-market opportunities also reduces the opportunity cost of schooling: attendance rates actually *rose* among 15- to 18- year-olds during the period.

A number of other studies also look at the relationship between aggregate income shocks and investments in education and conclude that there is no negative impact of these phenomena on educational enrollment for children. For example, Escobal (2005) studies the effect of sudden economic downturns on household human-capital investments using a sample of children aged six to 14 from the Young Lives Survey in Peru. This study finds evidence that such downturns have an impact on the quality rather than the quantity of education. The authors observe that a negative income shock does not produce a change in the time spent on education, and that it only reduces the effective accumulation of human capital through cuts in public spending on education. However, another study, by Duryea and Lam (2007), uncovers a negative

impact of the crisis in Brazil on school attendance and enrollment: Brazilian youth adjust their school and labor-force participation behavior in response to an unexpected transitory shock to the household by increasing their labor-force activity. The authors compare households in which the male household head becomes unemployed during a four-month period with households in which the head is continuously employed. *Probit* regressions indicate that an abrupt fall into unemployment significantly ups the probability that a child will enter the labor force, drop out of school, or fail to advance in school. The results suggest that some households are not able to absorb short-run economic shocks, with negative consequences for the children.

This paper looks at how the macro-shock from the 2008-09 financial crisis translated into falls in income and welfare in the form of reduced earnings and expenditures (particularly on food, education, and health consumption) at the household level in Turkey. Using a specialized household-level survey and an instrumental-variables technique, the paper estimates the causal impact of the income shock on household welfare and consumption. Instrumenting for the income shock at the household level, the paper establishes the link between the income shock and changes in expenditure patterns. It finds that while education and health expenditures and utilization were largely protected throughout the crisis in Turkey, most households have reduced their consumption of those food products that have traditionally taken up a large portion of the initial expenditure basket for Turkish households.

The main questions this study attempts to answer are: (i) Who was more likely to be impacted by the macro-shock? What types of workers and households were likely to report reductions in earnings? (ii) How did the macro-shock affect the income and expenditures of households? Which expenditure items were most likely to be cut back in the face of the income fall-off?

The outline of the paper is as follows: Section 1.1 continues with a description of the financial crisis of 2008-09 in Turkey. Section 2 provides the conceptual framework for how we envision households' consumption was impacted, given an income shock. In this section, the empirical strategy for estimating the welfare impact of the income shock is also put forward. Section 3 provides information on the data sources used for this study and explains the construction of key variables in the analysis. Section 4 gives the empirical results for the *probit* and IV estimations, and Section 5 concludes with the main findings.

1.1 The Context of the Financial Crisis in Turkey

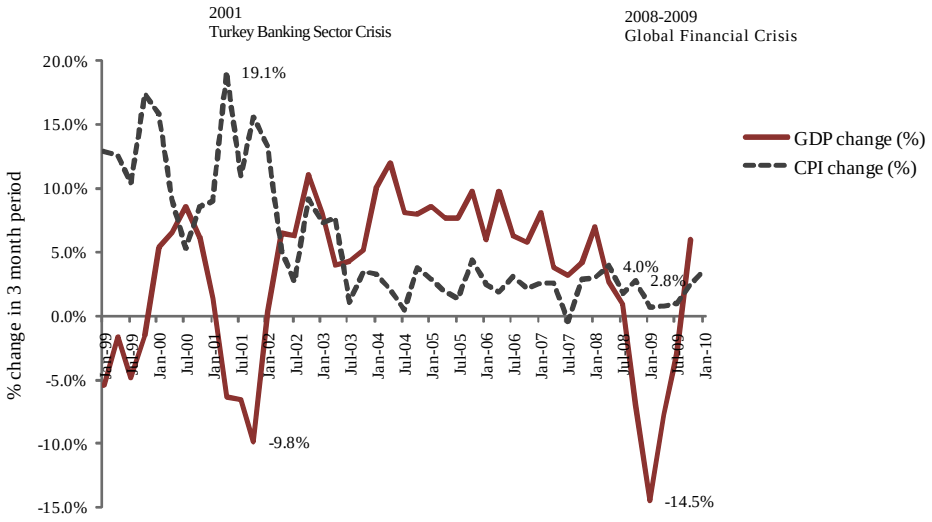
In the wake of the worldwide economic slowdown in 2008, Turkey's GDP contracted by 7% in the last quarter of 2008 compared to the third quarter of that year. In the first quarter of 2009, GDP fell by a further 14.5% and continued to shrink throughout the year (see Figure 1), decreasing an overall 4.7%. Unemployment levels, particularly among the youth, soared in the first quarter of 2009. Having remained stable at levels below 10% for several years, the unemployment rate in Turkey peaked at 16.1%—reaching 28.6% among the 15-24 age bracket—in the first quarter of 2009, and job creation slowed throughout the year (see Figure 2).

The three main channels via which a macro-crisis could hurt households are: (i) the reduction in labor income; (ii) changes in the price level; and (iii) a drop in public expenditures that may adversely affect households. In Turkey, the price level during the 2008-09 financial crisis remained relatively stable, with year-on-year inflation at 5.3% between June 2008 and June 2009. Commodity price index (CPI) stability is also demonstrated in Figure 1. As public expenditures in this period were on the rise, no downward shift in public spending that would hurt households was expected. The non-interest spending of the central government rose from 204 billion TL in 2007 to 227 billion TL in 2008 and to 268 billion TL in 2009. The increases were 13.6% in 2008 and 21.9% in 2009, and in both years exceeded the rate of inflation in Turkey; hence, one can speak of a real increase in public spending through the period of the crisis. Likewise, the share of government spending in GDP jumped in this time period, from 18.4% in 2007 to 22.6% in 2009[1]. Given this macro-background of price levels and fiscal spending, the main transmission mechanism via which the financial crisis influenced households was through reduced labor earnings.

Turkey had previously experienced a major crisis in its banking sector that led to an economic slump in 2001. Back then, the major transmission mechanism of the crisis to the household level was through changes in the overall price level (households had lower purchasing power, arising from the climb in the price level). In the first quarter of 2001, the consumer price index was up by 19.1% over the previous three-month period, following the devaluation of the Turkish lira. In the same time period, GDP had declined by 10%. Compared to the 2001 banking crisis, there was a *sharper* reduction in GDP levels in the 2008-09 economic recession, though the price level stayed relatively stable, with a quarterly inflation level of less than 5%. Given this background, it is fair to say that unlike the earlier economic crisis in the country, the global

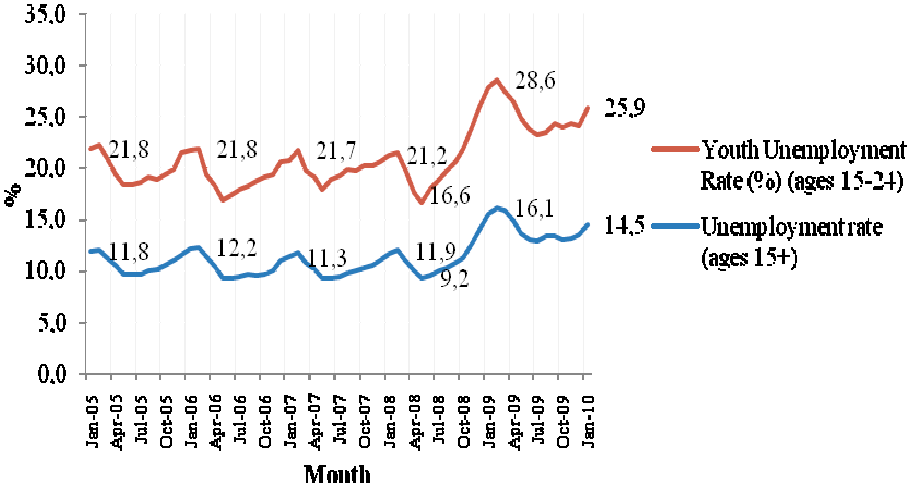
[1] Source: Ministry of Finance, Turkey.

Figure 1. Severity of the Macro-Shock: Changes in GDP and CPI (% change in three-month period)



Source: TURKSTAT

Figure 2. Unemployment and Youth Unemployment Rates in Turkey (Jan. 2005 – Jan. 2010)



Source: TURKSTAT

financial crisis of 2008-09 caused pain in Turkish households mainly through changes in household income via reduced employment and earnings. The rest of this paper focuses primarily on this transmission mechanism in measuring changes to household welfare.

2. Conceptual Framework

2.1 The Model

To analyze changes in consumption behavior at the household level, this paper uses a conceptual model with "hierarchical preferences" in the household's utility function (for the sake of its expositional simplicity). In this model, the utility function is defined in a way whereby individuals require a minimum level of good x (in this case, food), and they also consume other goods, y. Preferences are hierarchical such that a minimum amount of food x_0 needs to be purchased before individuals can obtain utility from food and other goods. The utility function is of the form:

$$U(x, y) = (x - x_0)^{\alpha} y^{\beta} \tag{1}$$

Subject to the food-satiation constraint:

$$X \leq X_{\max}$$

The part of the budget constraint that can be allocated by the household is expressed as the total income minus the amount of expenditure necessary to purchase x_0:

$$I^{*} = I - p_x x_0 \tag{2}$$

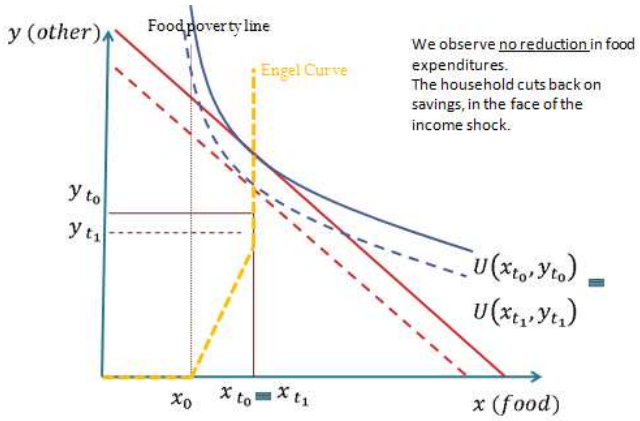
In the face of an income shock, households with different initial income conditions respond to the new circumstances in different ways because of the hierarchical-preferences assumption. We consider here the hypothetical cases of a high-income, middle-income, and low-income household operating under this utility function. Figure 3 provides the utility function and the changes in consumption of good x and good y in the face of an income shock on the three household types. The red curve in the figure represents the budget constraint, which shifts back with the income shock experienced in the household. The Engel Curve outlined in yellow starts on the x-axis and continues along the x-axis until the point consumption of x reaches x_0. At that satiation point, the household begins to consume goods other than food. The simplified model with hierarchical preferences makes sure that a household consumes only food until

it reaches a satiation point of x_0 in food consumption. The satiation point for food comes at some point, and then the Engel curve becomes vertical, with the household consuming only *y* with any extra income beyond this satiation point.

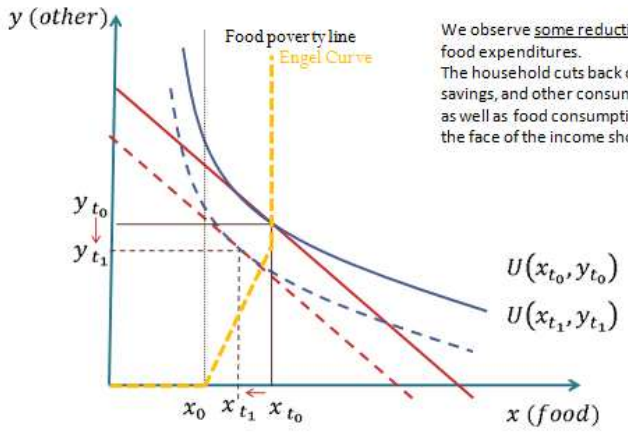
According to the permanent-income hypothesis, consumption patterns are determined by a change in permanent income rather than changes in transitory income. Temporary changes in income should have little effect on the consumer's spending behavior (Friedman, 1957). If this hypothesis holds, and if households are able to smooth consumption, we should state that consumption changes occur because the household interprets a certain portion of the transitory shock to be permanent, or that the transitory shock is large enough to cause the permanent income of the household to come down. However, if households are not able to smooth consumption, we should see consumption coming down with the transitory income shock, even if the impact on permanent income is small. When looking at the ways in which households coped with the crisis, we found that households that were able to smooth consumption by accessing formal and informal safety nets, or through borrowing, were less likely to reduce consumption. Thus, in the absence of a mechanism to smooth consumption, households respond to transitory income shocks by cutting back on consumption.

Figure 3. Income Shock and the Consumption Response

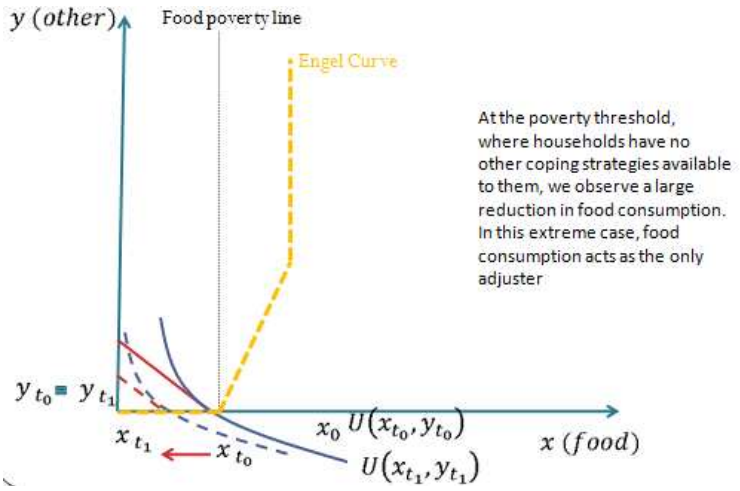
Panel A: Income shock experienced by a high-income household



Panel B: Income shock experienced by a middle-income household



Panel C: Income shock experienced by a low-income household



For the high-income household described in Figure 3, Panel A, the shift in the budget constraint does not change the level of food consumption, since the household is already beyond satiation point, and any reduction in income gets reflected in the reduction in the consumption of *y*, other goods. The middle-income household in Panel B is initially below the food-satiation point; hence, a reduction in income reduces the consumption of both the food and non-food

goods in the consumption basket. In Panel C, the situation of a low-income household is depicted; for this household, $x < x_0$ in the initial conditions, so the income shock gets disproportionately reflected in household food consumption. We can expect the pattern of changes in consumption to follow the model outlined here, with poorer households having less fungible resources to allocate away from food expenditures, thus having a higher likelihood of having to reduce food expenditures within the overall household budget.

Table 1 provides the levels of food and non-food expenditures in household budgets in Turkey as of 2008 (prior to the crisis). Here Engel's Law can be observed for Turkish households, with households in the poorest decile allocating up to 43% of their total household expenditures to food. Housing constitutes the second-largest expenditure item in the household consumption bundle for Turkish households in the poorest decile. Since housing expenditures, mostly in the form of rent, are discrete and more difficult to substitute away from, they are regarded as *not* being part of "fungible" income in this model. A household would not be able to substitute away from or reduce rent expenditures in the very short term; therefore, food expenditures are most likely to bear the brunt of consumption belt-tightening in the aftermath of an income shock for a poor household, as predicted in this model.

2.2 Empirical Strategy

The hypothesis put forward in the above model relates to the changes in the consumption patterns of households following an income shock—namely, that they reduce food consumption in the short term, particularly if they are in the poorer quintiles.

First, the paper looks at the probability of reporting reduction in earnings through the first eight months of the global financial crisis, between October 2008 and May 2009, in order to establish what types of workers and households were most likely to be constrained in terms of their income in this period. In the model, October 2008 and May 2009 are referred to as t_1 and t_2, respectively.

The predicted probability of lower earnings by the household head is estimated using a *probit* regression of the form:

$$\Pr(\Delta Y_i)=\alpha_1 \Delta X_p + \alpha_2 A_{i(t1)} + u_i \quad (3)$$

$$\Pr(\Delta Y_i)=\alpha_1 \Delta X_p + \alpha_2 A_{i(t1)} + \alpha_3 \Delta X_p A_{i(t1)} u_i \quad (4)$$

Table 1. Household Expenditures by Decile (2008)

Deciles of Per capita Expenditure	Total Spending	Food	Alcohl	Clothing	Housing	Furniture	Health	Transport	Communication	Entertainment	Education	Restaurants	Various
Poorest decile	100.0%	**43.5%**	9.8%	7.5%	25.2%	5.5%	**3.1%**	8.1%	5.7%	1.7%	**4.7%**	4.0%	3.5%
2	100.0%	**37.1%**	10.0%	7.2%	28.0%	5.7%	**2.7%**	8.6%	5.0%	2.4%	**4.7%**	4.7%	3.5%
3	100.0%	**32.7%**	9.4%	6.6%	29.9%	5.2%	**2.8%**	9.0%	4.9%	2.0%	**5.0%**	5.1%	3.6%
4	100.0%	**29.8%**	8.7%	6.4%	30.6%	5.7%	**3.0%**	9.7%	4.9%	2.8%	**4.6%**	5.3%	3.2%
5	100.0%	**27.6%**	7.5%	6.7%	31.9%	6.1%	**2.7%**	10.0%	4.7%	3.1%	**4.8%**	5.0%	3.6%
6	100.0%	**26.5%**	7.6%	7.0%	30.4%	6.2%	**2.6%**	10.6%	5.3%	3.2%	**4.5%**	5.4%	3.8%
7	100.0%	**24.7%**	7.2%	7.3%	31.7%	6.0%	**2.5%**	11.4%	5.0%	3.1%	**5.1%**	5.0%	3.6%
8	100.0%	**23.8%**	6.8%	6.9%	30.3%	6.4%	**3.5%**	12.7%	5.2%	3.0%	**5.5%**	5.0%	4.0%
9	100.0%	**21.8%**	6.0%	6.8%	29.2%	6.4%	**3.3%**	14.8%	5.1%	3.4%	**5.9%**	5.2%	4.4%
Richest decile	100.0%	**15.1%**	3.7%	6.9%	23.4%	6.7%	**3.7%**	26.2%	3.8%	4.4%	**9.4%**	4.8%	5.6%
Total	100.0%	**23.5%**	6.4%	7.2%	28.2%	6.3%	**3.3%**	16.5%	4.9%	3.7%	**7.0%**	5.3%	4.4%

Data Source: Household Budget Survey 2008

The dependent variable Pr (ΔY_i) in Equation 3 is the probability of reporting lower earnings in current job in time period 2 (t_2) compared to time period 1 (t_1). The workers who report being "employed" in t_1 and subsequently lose their job by t_2 are also recorded as having reduced earnings. Hence, the dummy variable for the dependent variable takes a value of 1 for those who actually receive lower earnings and for those who have lost a job. The explanatory variables in the first-stage regressions include the province-level macro-shock variable (ΔX_p), which is defined as the rate of change in non-cash credit from banks in the province. In these regressions, ΔX_p can be interpreted as a proxy variable for the intensity of the "credit crunch" experienced at the province level (see Section 3.2). $A_{i(t1)}$ denotes the characteristics of the worker as of t_1, and includes the labor status and the educational attainment of the household head. Each worker characteristic is provided as deviations from the mean in the regressions.

In the second specification provided in Equation 4, the worker characteristics are interacted with the province-level crisis proxy to see if the macro-shock from the crisis had a heterogeneous impact on workers of different characteristics. The specifications in Equations 3 and 4 are run for two different sub-samples: (i) all workers that held a job in t_1 and (ii) workers who are also household heads and held a job in t_1. In order to get robust standard errors for these regressions, the standard errors are clustered at the province level, since at least one explanatory variable (namely, ΔX_p) varies only at the province level and takes on only seven values.

Second, a *probit* estimation is run to establish the positive correlation between the income shocks experienced at the household level and any associated reduction in welfare as measured by the consumption of the household on food, education, health, or other expenditures. The marginal effects of the following *probit* regressions are reported:

$$\Pr(\Delta C_j) = \beta_1 \Delta Y_j + \beta_2 A_{j(t1)} + u_j \quad (5)$$

$$\Pr(\Delta C_j) = \beta_1 \Delta Y_j + \beta_2 A_{j(t1)} + \beta_3 A_{j(t1)} \Delta Y_j + \beta_4 H_j + u_j \quad (6)$$

Here, the dependent variable ΔC_j is the dummy variable for reporting lower expenditures or a change in behavior in consumption patterns between t_1 and t_2. ΔY_j is the dummy variable for the household head reporting a reduction in earnings between t_1 and t_2. Only the sample of household heads who were working in t_1 is included in these regressions. The characteristics denoted by A_j are provided at the household level. These include urban/rural location,

educational attainment of the household head, and the household-asset index, and are demeaned in the regressions. The interaction term between household-head initial characteristics and the dummy variable for reporting the earnings shock is added to the specification in Equation 6, where H_j includes household-composition variables (number of children and adults in the household), and u_j represents the error term in the equation.

The possible labor-supply responses to the income shock are (i) the added worker effect (where household members who were not active in the labor market begin to look for jobs, or take jobs), and (ii) taking secondary jobs for those who are already employed. The variable in the regressions defining the income shock is whether the household head has lost his or her main job in October 2008, and whether he/she reports a reduction in earnings from the main job. If either of the above conditions occurs, the actual income shock to the household would be smaller than described in the data. In this sense, the impact of the income shock (the coefficient on the income shock β_1, in the consumption regressions in Equations 5 and 6) would be a lower-bound estimate of the actual impact of the labor-income shock on expenditures and consumption.

The specifications in Equations 5 and 6 assume the income shock at the household level as an exogenous variable and looks at its effect on consumption behavior. These *probit* regressions are run separately for food, education, and health expenditures. The coefficient on β_1 gives the relationship between the earnings shock and changes in consumption, controlling for household-head characteristics. In the specification with the interaction terms, the coefficient on β_3 gives the heterogeneous response of the households associated with an earnings shock.

The maximum-likelihood *probit* model estimates of the coefficients of the earnings shock may be inconsistent and/or biased if (i) there is a correlation between the responses to the changes in income and the responses to the changes in expenditures and consumption questions (in which case the earnings-shock variable would become endogenous in the model), and if (ii) there is a measurement error in the earnings-shock variable, which would result in attenuation bias on the coefficient β_1 of the earnings shock at the household level. We can suspect that both of these problems may exist in the survey data used in this paper.

There is a risk for the potential endogeneity of the earnings shock. The income shock and consumption changes are both subjectively reported in the rapid survey data and may be correlated with each other as a result of the respondent's desire to reduce "*dissonance*" in the responses. Cognitive disso-

nance can be defined as a discomfort caused by holding conflicting ideas simultaneously[2].

1. Given that the data are based on "perceptions" of consumption, we may worry that people have erroneously reported lower levels of food consumption if they had already reported lower levels of earnings in the data set. In that case, the income shock would not be exogenous to the probability of reporting a change in consumption. For instance, a household head who reports a reduction in his earnings may be more likely to also say that the household has reduced food consumption. This problem would result in an *overestimation* of the size of the β_1 coefficient in Equation 5.

2. Measurement error on the earnings shock: the data on earnings are based on recall data and are a categorical variable that asks the worker to assess whether his earnings in the current job (in t_2) are higher, lower, or at the same level as his earnings at the onset of the crisis in t_1. Any measurement error that results from recall data would generate an attenuation bias in the estimation of β_1 whereby the estimated plim(β_1) is always closer to zero than β_1. This measurement problem would result in an *underestimation* of the size of the β_1 coefficient in the maximum-likelihood *probit* model in Equation 5.

To find consistent and unbiased estimates for the coefficient of the earnings shock in the model in Equation 5, this paper next implements an instrumental-variables approach. A 2SLS strategy is chosen to establish the causal link between the idiosyncratic income shock at the household level and the changes in different types of consumption.

The excluded instruments in the model have to satisfy the relevance and validity conditions. The instruments have to be strongly correlated with the earnings shock at the household level (X) and uncorrelated with the unobservable error, u. The instrumental-variable matrix, z, should have the property that changes in z are associated with changes in the earnings variable at the household level but do not lead to changes in expenditures/consumption (except indirectly through earnings). In this paper, two variables are used to instrument for the earnings shock at the household level: the severity of the crisis at the province level (as proxied by the rate of change in non-cash credit available from banks in the province[3]), and the formal/informal sector employment of the household head.

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[2] The theory of cognitive dissonance proposes that people have a motivational drive to reduce dissonance and that they do this by changing their attitudes, beliefs, and actions (Festinger, 1957).

[3] The definition of the crisis-proxy variable is described in detail in Section 3.2.

The inspiration for the instrument in the 2SLS estimation comes from the earnings *probit* provided earlier in Equation 3 and later in Table 6. The paper has already established a strong linkage in these results between the province-level macro-shock and the probability of an earnings shock at the household level. The formal/informal sector employment of the household head was also strongly associated with the probability of receiving a shock to the earnings of the household head. In this section, the paper instruments for the potentially endogenous earnings-shock variable using the province-level macro-shock variable and the (formal/informal) sector of employment of the household head. Both of these instruments are strongly correlated with the probability of the household head receiving an earnings shock in the crisis period (as will later be shown in first-stage regressions of the 2SLS estimation), and we expect them to be *uncorrelated* with consumption decisions at the household level.

To instrument for the household-level earnings-shock variable, which may potentially be endogenous or mismeasured, this paper uses two instruments that are closely linked to the predicted probability of receiving an income shock at the household level: (i) the intensity of the macro-shock in the province where the household is located, and (ii) the formal/informal labor status of the household head prior to the onset of the crisis in t_1.

The 2SLS specification can be formally stated as follows:

$$\Pr(\Delta C_j) = \varphi_1 \Delta \hat{Y}_j + \varphi_2 A_{j(t1)} + u_j \tag{7}$$

Here, $\Delta \hat{Y}_j$, the predicted level of the probability of receiving the income shock, is used to instrument for ΔY_j, the probability of experiencing an earnings shock in the household, which is potentially endogenous to the reported change in consumption. A_j represents household-head characteristics and, once again, in these regressions, the variables are defined as deviations from the mean. The primary goal of the 2SLS estimation in Equation 7 is to find *consistent estimates* for the impact of the earnings shock at the household level on household expenditures and consumption. The heterogeneous impact of the income shock on different types of households becomes more difficult to measure using 2SLS methodology, since each of the interaction terms need to also be instrumented for in turn in order to get consistent results of this estimation. Hence, the *probit* specification in Equation 6 with the interaction terms is not repeated using the 2SLS estimation.

3. Data

3.1 Data Sources

The main data set used for this paper is the Turkey Welfare Monitoring Survey (TWMS) baseline survey. This is a household-level survey that was designed as a rapid monitoring tool that would give immediate feedback to policymakers on the changes in the income and welfare levels of households during the financial crisis in Turkey. The survey was fielded twice in the same households: in May 2009 (baseline) and in December 2009 (panel). The World Bank and UNICEF provided the funding for the survey, and data collection was carried out by BAREM, a local research firm. We designed this survey with specialized modules that relate to coping strategies and access and utilization of safety nets. In this paper, only the baseline data from this survey are drawn on. However, the baseline survey already had *retrospective* questions that asked households to compare their levels of income, earnings, labor status, consumption, and utilization of education and health services in May 2009 (t_2) with those levels in October 2008 (t_1). In the survey questionnaire, October 2008 was selected as the reference period for most of these comparison questions, since it could be considered the beginning/onset of the crisis in Turkey as far as the macro-figures are concerned.

The sample in TWMS included a total of 2,402 households in seven provinces in Turkey. Five of these provinces encompassed urban city centers (Istanbul, Kocaeli, Izmir, Ankara, Adana), and a sample of 2,102 households was selected using stratified sampling. According to this, 100 PSUs were selected at the city-center level (pooled), with oversampling of poor neighborhoods and random sampling of households within each PSU. The data-sampling process was carried out in collaboration with the Turkish Statistical Institute (TURKSTAT). The weighted estimates of population averages in the urban sample, such as average education-attainment rates, labor-force participation rates, and employment composition by sector, compare closely with estimates provided by TURKSTAT in the official Labor Force (LFS) and the Household Budget Surveys (HBS) for Turkey. The two eastern rural provinces of Erzurum and Gaziantep in the sample covered 300 households. This rural sample was not meant to be representative of a specific area. For the purposes of this paper, the data from rural and urban samples were pooled, and weighting was not used in the regressions, although weights are used for urban observation when representing averages in summary statistics.

The second source of data used in the paper is financial administrative data on “non-cash credit available from banks” in Turkey by province, collected

and compiled by the Turkey Banking Sector Regulatory Agency (BDDK) and made available publicly on its website (www.bddk.org.tr). These data were used to construct the province-level "crisis proxy" variable in the earnings equations as well as the instrument in the 2SLS regressions. Further information on the construction of the crisis-proxy variable is available in the next section.

3.2 Description of Variables

The variables used in the Turkey Welfare Monitoring Survey are described in this section. The variable indicating the income shock at the household level comes from the labor module of the baseline survey (collected in May 2009), and asks the person to compare his or her earnings in the current job with October 2008. (*"Are your earnings in your current job higher, lower, or the same as you were earning in May 2009?")* The dummy variable for the earnings shock takes the value of "1" if (i) the person who was working back in October 2008 answers this question saying his or her earnings are lower in the current job, or (ii) if he reports he was employed as of October 2008 and became unemployed as of May 2009.

The previous labor status of the worker takes only two values in the survey: formal or informal sector employment. Formal-sector employment is defined by social-security coverage in the previous job (Question L11 in survey: *"Did the person have social-security coverage in the previous job?"*). The educational-attainment variables are defined in four categories of educational attainment (and are defined using Questions T12 in the survey *"What is the last diploma the person attained?"*). The four categories of attainment are defined as (i) illiterate or no diploma, (ii) primary-school diploma, (iii) junior- or high-school diploma, and (iv) higher education.

The change-in-consumption (welfare) variable is constructed using the expenditure and coping-strategy modules of the survey. The expenditure module asks whether the household's "expenditure" in each category of spending (food, education, and health) increased, remained the same, or decreased in the first five months of 2009 compared to the same time period in 2008. The coping-mechanisms module includes questions on the household's adaptation in behavior. The responses in this module are binary responses to questions such as *"Since October 2008, have you had to reduce the amount of food consumption in the household?", "Have you had to reduce the amount of food provided to the children?", "Have you had to reduce the utilization of health services?", "Have you had to withdraw a child from school or postpone enrollment?"*. Each of these coping questions was asked with the same time frame (for the period between October 2008 and May 2009), and they provide

binary information on whether the household resorted to this kind of adaptation in consumption behavior during the crisis period. These questions are used in the analysis as robustness checks on the main expenditures-dependent variables for food, education, and health.

The asset-index variable is constructed using household characteristics and assets in the housing module of the survey. The index is based on the Filmer-Pritchett methodology, whereby a principal-components analysis (PCA) is used to differentiate households according to the assets they own (Filmer and Pritchett, 2001). Each of the variables used in the asset index is first checked to see if it correlates positively with the income variable of the household[4]. Factor analysis is run on these household assets and housing characteristics as listed in Table 2, and households are eventually split into five equally-sized groups to create the quintiles separated by the asset index.

The TWMS is a useful and unique data set for quickly measuring the responses of Turkish households to the aggregate macro-shock during the period of the global financial crisis. The main limitation of the data set is that since the survey was designed as a rapid-response monitoring survey, both the income and consumption questions in the survey are based on perceptions of the respondent rather than on detailed income or consumption modules. These questions do not provide an indication of the "levels" of increase or decrease in income and consumption and merely provide dummy variables to be constructed for the shock. One would expect a larger income shock to have a different impact on consumption than a small income shock, though this kind of binary data allows us only to work with probabilities (discrete changes) and not continuous variables of income and consumption levels.

The second main data source used in this paper is the financial-sector data at the province level. The main financial-sector variable used in the construction of the instrument that predicts the severity of the financial crisis experienced at the household level is the rate of change in the amount of non-cash credit available from all banks in the province. Non-cash credit from banks includes (i) letters of credit and (ii) letters of guarantee, particularly necessary for exporting companies to be able to continue their business. This variable was chosen for the construction of the instrument as it is a viable province-level predictor of the probability of receiving an earnings shock at the household level, while not being related to changes in consumption at the household level except through its impact on local companies in the province and the labor income/earnings of workers in the province. Since non-cash credit is

[4] Only variables that are positively correlated with income should be included in the estimation of the asset index.

Table 2. Variables Used in the Construction of the Asset-Index Variable

Housing Characteristics:	**Household Assets:**	
	· Fridge	Cable TV
· Type of housing: (1 "Town House/other" 2 "Basement/tenement" 3 "Single house"	· Electric oven	· Camera
4 "Apartment")	· Microwave	· CD Player
· Number of rooms	· Dishwasher	· Telephone
· Size of housing	· Blender	· Cell Phone
· Source of Water (1 "truck/spring/other" 2 "well" 3 "pipe")	· DVD Player	· PC
· Type of Toilet (1 "pit/other" 2 "sewage")	· Washing machine	· Internet
· Type of Floor (1 "Cement" 2 "Earth" 3 "Marley" 4 "Karo/rudim. wood/other"	· Video Camera	· Private Car
5 "carpet/mosaic" 6 "polished wood")	· Air conditioner	· Taxi Minibus
	· Satellite cable	· Tractor
	· Vacuum cleaner	· Motorcycle
	· TV	· Bicycle
	· Video	· Number of TVs
	·	· Number of Cell Phones
		· Number of Private Cars

provided only to companies and not to households, and does not translate into an increased monetary "liquidity" in the province, this variable is not related directly to the changes in consumption for households. The crisis-proxy variable (X_p) in Equations 3 and 4 that feeds into the definition of predicted probability of receiving the earnings shock is constructed as a "*deceleration*" in the availability of non-cash credit (NCC) from banks in the following way:

$$X_p = \text{Rate of reduction in NCC from banks} \quad (8)$$

$$= (\%\Delta NCC_{p(t0)}) - (\%\Delta NCC_{p(t1)})$$

Here, NCC_p indicates non-cash credit available from banks in the province; t_0 stands for the nine-month period from December 2007 to September 2008; and t_1 stands for the nine-month period from September 2008 through June 2009. A data summary of the changes in the variable of non-cash credit from banks and the calculation of the crisis-proxy variable by province appears in Table 3.

It is important to understand the reason for using "rate of change" in non-cash credit (a *deceleration* variable) rather than a "percentage change" or "level" variable for this indicator. The seven provinces in the data set are different from one another in terms of economic development and financial penetration in the initial conditions; hence, *levels* of non-cash credit cannot be used as a comparison variable for the change in economic conditions. Nor can the "percentage change" in non-cash credit available in these two time periods be used as an indicator variable, since three of the seven provinces still display a positive increase in non-cash credit from banks even in the period September 2008 to June 2009, although the expansion of non-cash credit has slowed as a result of the crisis. As such, using the positive-percentage-change indicator does not sufficiently describe the deceleration in growth taking place in these provinces. It was essential, therefore, to *de-trend* the growth trajectory in this variable and look at the *rate of change* in non-cash credit, comparing the growth in this variable in t_1 with growth in t_0.

4. Empirical Results

4.1 Summary Statistics

A large percentage of households in the TWMS sample report a reduction in household income in the first eight months of the crisis. Of the total sample of 2,402 households, 16.6% of them report that the head of household had lower earnings in his or her main job (or had lost a job) between October 2008

Table 3. Administrative Data on Non-cash Credit from Banks, by Province in Turkey

				A	B	B-A
	December-07	September-08	June-09	(% change in noncash credit from banks in province Dec 2007- Sep 2008.)	(% change in non-cash credit from banks between Sep 2008 and June 2009)	Xp = Rate of reduction in non-cash credit available from banks
ADANA	1,468,413	1,883,069	1,719,041	-8.71%	28.24%	36.95%
ANKARA	19,481,350	24,677,791	31,753,881	28.67%	26.67%	-2.00%
ERZURUM	165,603	195,135	183,117	-6.16%	17.83%	23.99%
GAZİANTEP	1,450,283	1,845,386	2,055,470	11.38%	27.24%	15.86%
İSTANBUL	50,478,581	62,978,770	66,351,274	5.35%	24.76%	19.41%
İZMİR	4,317,569	5,522,260	5,128,869	-7.12%	27.90%	35.03%
KOCAELİ	2,356,751	2,696,476	2,252,427	-16.47%	14.41%	30.88%
TURKEY (TOTAL)	**94,469,968**	**117,128,527**	**126,756,979**	8.22%	23.98%	15.76%

Note: X_p= (% change in non-cash credit from banks between Sep 2008 and June 2009) - (% change in noncash credit from banks in province in Dec)

Data source Turkey Banking Sector Regulation Agency (BDDK)

Table 4. Summary Statistics for Changes in Household Income (Oct 2008-May 2009)

			Observations	Mean	Std. Err	Binomial Dist. [95% Conf. Interval]	
TOTAL in SAMPLE	**TOTAL**	Lower earnings for HHhead in May 2009 when compared to Oct 2008	2,402	16.6%	0.0076	15.1%	18.1%
		Reduced wage income (at HH level)	2,402	13.3%	0.0069	11.9%	14.7%
		Reduced Self-employment income (at HH level)	2,402	7.3%	0.0053	6.3%	8.4%
		Reduced income from Pensions (at HH level)	2,402	2.8%	0.0034	2.2%	3.6%
		Reduced income from Private Transfers and Remittances (at HH level)	2,402	1.5%	0.0025	1.1%	2.1%
By Employment Status of Household Head (as of October 2008)	**Employed formally**	Lower earnings for HHhead in May 2009 when compared to Oct 2008	963	27.2%	0.0143	24.4%	30.1%
		Reduced wage income (at HH level)	963	15.0%	0.0115	12.8%	17.4%
		Reduced Self-employment income (at HH level)	963	10.1%	0.0097	8.2%	12.1%
		Reduced income from Pensions (at HH level)	963	0.7%	0.0027	0.3%	1.5%
		Reduced income from Private Transfers and Remittances (at HH level)	963	0.5%	0.0023	0.2%	1.2%
	Employed informally	Lower earnings for HHhead in May 2009 when compared to Oct 2008	323	42.1%	0.0275	36.7%	47.7%
		Reduced wage income (at HH level)	323	22.3%	0.0232	17.9%	27.2%
		Reduced Self-employment income (at HH level)	323	14.6%	0.0196	10.9%	18.9%
		Reduced income from Pensions (at HH level)	323	2.2%	0.0081	0.9%	4.4%
		Reduced income from Private Transfers and Remittances (at HH level)	323	1.5%	0.0069	0.5%	3.6%
	Not working	Lower earnings for HHhead in May 2009 when compared to Oct 2008	-	-	-	-	-
		Reduced wage income (at HH level)	1,116	9.2%	0.0087	7.6%	11.1%
		Reduced Self-employment income (at HH level)	1,116	2.8%	0.0049	1.9%	3.9%
		Reduced income from Pensions (at HH level)	1,116	4.8%	0.0064	3.7%	6.3%
		Reduced income from Private Transfers and Remittances (at HH level)	1,116	2.4%	0.0046	1.6%	3.5%

Data source: Turkey Welfare Monitoring Survey (May 2009)

and May 2009. Among households where the household head is employed informally, the percentage reporting at least one person with lower earnings is much higher, at 42.1%. Table 4 provides summary statistics on reduced reported earnings at the household level by sector of employment (as of October 2008) of the household head.

In the rapid-monitoring survey sample, Turkish households most frequently report decreases in food expenditures and consumption, while expenditures on education and health services in the face of the crisis remain more stable (or increase). In the expenditures module of the survey, households are asked if they have had to reduce expenditures on certain items. Roughly 43.5% of households in the sample respond that they have cut down on their spending for food items during the October 2008-May 2009 period. In comparison, only 8.9% of households claim to have spent less on education, and 14.4% say the same about their health expenditures (see Table 5).

In the coping-strategies module of the survey, households are then questioned about whether they have had to change certain forms of behavior since the onset of the crisis, and again we see significant adjustments in food-consumption behavior: 70.9% of the households mention having "substituted into cheaper food items," 56.8% say they "have reduced the amount of food consumed," and a worrying 24% admit having had to "reduce the amount of food provided to children" in the household. Health-care utilization falls for about one-fifth of the sample of households: 20.5% report less use of health-care services, and 18.7% state they have turned to preventive-care services less since the onset of the crisis. Educational enrollments are for the most part protected through this time period: less than 3% of households report "withdrawing children from school/postponing admission to school," or "transferring children to a cheaper public or private school" (see summary statistics in Table 5).

Reductions in food consumption and expenditures are more likely for the poorest households in the sample, as predicted by the model presented in the conceptual framework. The overall changes in food, education, and health expenditures are depicted in non-parametric form in Figure 4. In these figures, the y-axis varies between -1 and 1, and the dependent variable takes three values: 1 if expenditures in this category have increased, 0 if they have remained the same, and -1 if they have decreased in the first months of 2009 when compared to the first five months of 2008. As reported in the top left-hand panel of Figure 4, most households in the sample report reductions in food expenditures in this time period, and the likelihood of such reporting increases with lower levels of the asset index. In other words, as predicted by the model, poorer households are more likely to report reductions in their food

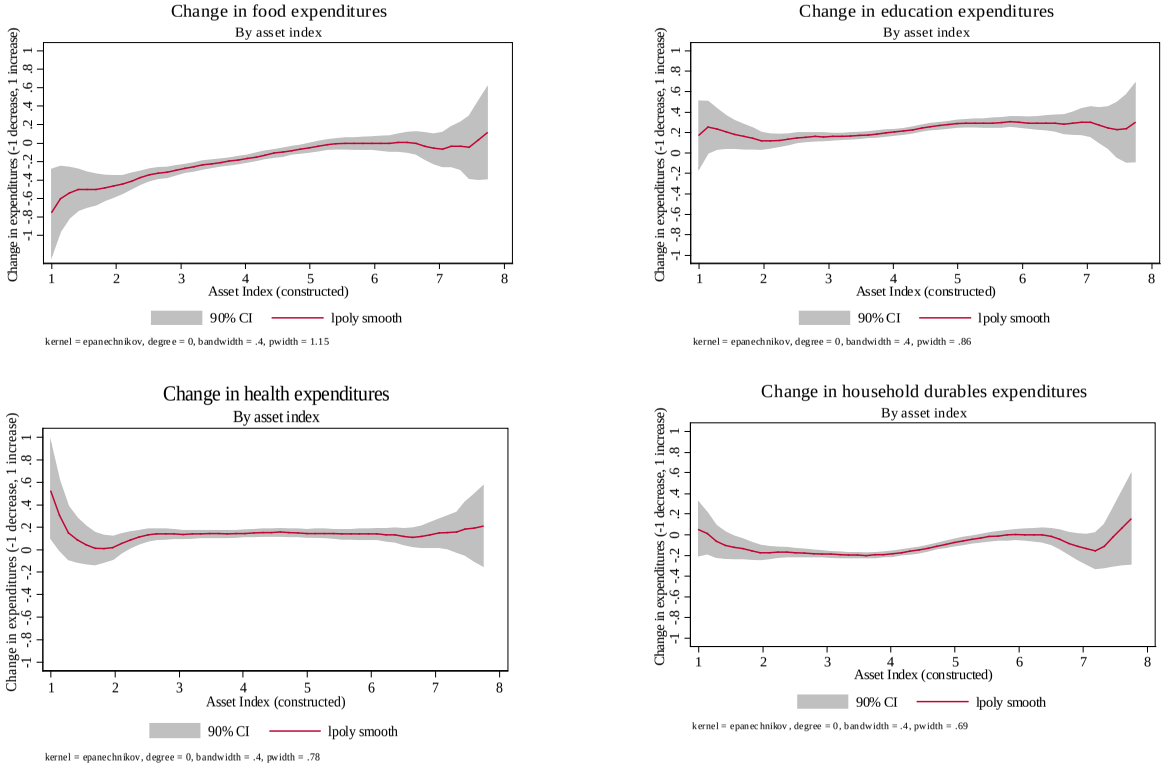
Table 5. Summary Statistics for Changes in Household Consumption and Welfare through the crisis

	Observations	Mean	Std. Err	Binomial Dist. [95% Conf. Interval]	
Changes in Expenditures (compare Jan-May 2009 to Jan-May 2008):					
Reduced expenditures on food	2,402	43.5%	1.01%	41.5%	45.5%
Reduced expenditures on education	2,402	8.9%	0.58%	7.8%	10.1%
Reduced expenditures on health	2,402	14.4%	0.72%	13.1%	15.9%
Reduced expenditures on household durables	2,402	22.1%	0.85%	20.5%	23.8%
Changes in Consumption and Welfare (Oct 2008-May 2009)					
Food related:					
Decreased amount of food consumption	2,402	56.8%	1.01%	54.8%	58.8%
Substituted into cheaper food items	2,402	70.9%	0.93%	69.0%	72.7%
Were short of money and had to "stretch" food consumption	2,402	51.0%	1.02%	49.0%	53.1%
Had to reduce the amount of food for your children?	2,402	24.0%	0.87%	22.3%	25.8%
Education related:					
Withdrew/postponed admission to school, private high school, or kindergarten.	2,402	2.7%	0.33%	2.1%	3.4%
Transferred children to cheaper public or private school	2,402	1.0%	0.21%	0.7%	1.5%
Health related:					
Reduced the use of health services	2,402	20.5%	0.82%	18.9%	22.2%
Reduced visits to the doctor for preventive medical checkups	2,402	18.7%	0.79%	17.1%	20.3%

Data source: Turkey Welfare Monitoring Survey (May 2009)

Figure 4. Changes in Expenditures, by Category

The y-axis indicates a decrease in expenditures (-1) , no change in expenditures (0), or an increase in expenditures (+1) as a categorical variable. The time frame for the changes in expenditures is January-May 2009; expenditure levels on these items compared to January-May 2008.



Data source: Turkey Welfare Monitoring Survey (May 2009)

expenditures. Changes in expenditures on education, health care, and household durables are also provided in the other panels of this figure. For the lowest values of the constructed-asset index, the mean of the categorical variable indicating changes in food expenditures is about -0.8 (on a range of -1 to 1). By contrast, in the same time period, education expenditures are likely to *increase* for the poorest as well as the richest households in the sample. The mean of the categorical variable on change in expenditures is around 0.2 for education expenditures. The change in health expenditures is also on average *positive* for the poorest asset households, and we observe little change in expenditures on household durables, where the mean level of change hovers around zero for all wealth levels.

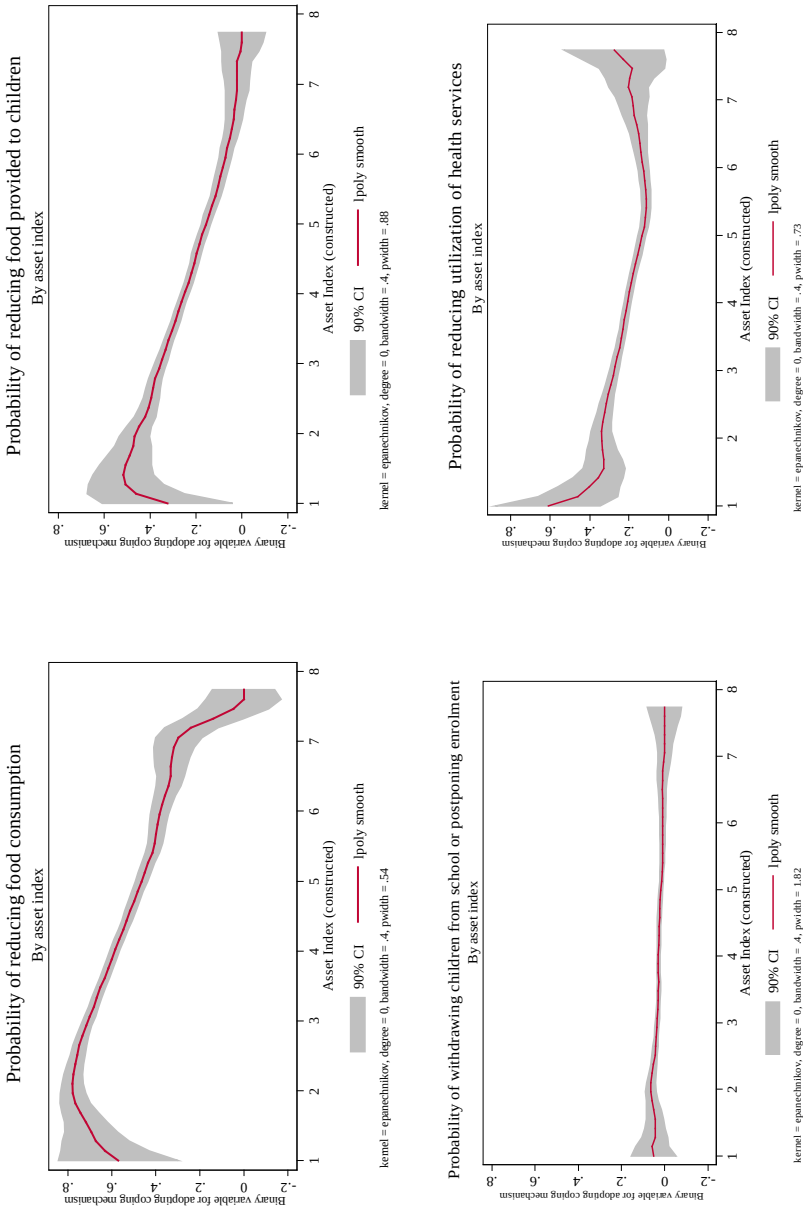
The insights we gain from Figure 4 are also confirmed by responses to other consumption-related questions in the coping-strategies module of the survey; these relate to food consumption and utilization of education and health services throughout the crisis period. Specifically, the respondents are asked whether they have had to change or adapt their behavior in certain respects in the October 2008-May 2009 period. Their responses are coded as dummy variables and plotted against the asset index in Figure 5. The y-axis in this figure varies between 0 and 1 and provides the predicted probability of adopting a certain change in behavior through the crisis period by levels of the asset index. In the top panels of the figure, we observe that the probability of reducing food consumption is highest for the poorest asset holders in the sample, with the predicted probability varying between 60% and 80% for the lowest levels of the asset index. The probability of reducing the amount of food provided to children is also around 40-50% for the poorest in the sample. In fact, only the very top levels of the asset index report no changes in food consumption and no need to reduce the amount of food provided to children, where the predicted probability of reducing food consumption hits zero (see Figure 5 top two panels).

4.2 Main Results

4.2.1 Changes in household-level earnings given the macro-shock

The probability of reporting reduced earnings for all workers (and for workers that are also household heads) is linked closely to the macro-level shock at the province level. The results of the earnings regressions that show the heterogeneous impact of the macro-shock on workers by sector of employment and educational attainment—as stated in Equations 3 and 4—are provided in Table 6. In the specification in Equation 3, where only the level effects of worker characteristics are considered, a 100% increase in the mac-

Figure 5. Probability of Adopting Certain Coping Strategies, by Household Asset Index



Data source: Turkey Welfare Monitoring Survey (TWMS)

Table 6. Link between the Macro-Shock and Household-Level Income Shock: probability of getting shock to earnings given province level macro-shock and worker characteristics- Reporting marginal effects from the Probit Regressions. (Refer to equations (3) and (4) in empirical specifications)

Dependent variable:	Earnings are lower in May 2009 compared to Oct 2008[16]			
	All workers in sample		Workers in sample who are also household heads	
	(1)	(2)	(3)	(4)
Crisis proxy at province level	0.294***	0.303***	0.377**	0.381**
	(0.0937)	(0.106)	(0.150)	(0.161)
Educ: Illiterate or no schooling	0.141**	0.271**	0.138**	0.380
	(0.0649)	(0.125)	(0.0657)	(0.248)
Educ:Primary School	0.166***	0.170***	0.186***	0.154**
	(0.0366)	(0.0620)	(0.0415)	(0.0648)
Educ: Junior or Senior High School	0.0649*	0.0305	0.0937*	0.0352
	(0.0341)	(0.0353)	(0.0492)	(0.0494)
Labor status of worker: Informal	0.126***	0.0581*	0.160***	0.0847
	(0.0210)	(0.0301)	(0.0396)	(0.0843)
Crisis proxy X Illiterate or no schooling		-0.588		-0.936
		(0.424)		(0.878)
Crisis proxy X Primary School		-0.0133		0.168
		(0.246)		(0.243)
Crisis proxy X Junior or Senior High School		0.163		0.292*
		(0.128)		(0.159)
Crisis proxy X Informal Status		0.321**		0.357
		(0.143)		(0.321)
Observations	1,889	1,889	1,163	1,163

Robust standard errors in parentheses (clustered at the province level) *** p<0.01, ** p<0.05, * p<0.1

[16] Definition of lower earnings includes those workers who were employed in October 2008 and subsequently lost their jobs and were unemployed by May 2009.

ro-shock variable at the province level is associated with a 29.4-percentage-point increase in the probability of reporting reduced earnings for workers who are employed formally and have a higher-education degree (p value < 0.01) (Table 6, Column 1). For the sub-sample of workers who are also household heads, the association between the macro-shock and the probability of reduction in earnings is even stronger, with a coefficient of 37.7 percentage points (p value < 0.05) (Table 6, Column 3) for formally employed workers with degrees in higher education. Workers employed in the informal sector as of October 2008 and those with lower levels of education are more likely to have received a shock to their earnings. Being an informal worker is associated with an *increase* in the probability of reduction in earnings by 12.6 percentage points. Having no formal education is associated with an increase in the probability of reduced earnings by 14.1 percentage points in the sample of all workers (and 13.8 percentage points in the sample of household-head workers) when compared to those with higher-education degrees. Those with only primary-school diplomas are 16.6 percentage points (18.6 percentage points in the sample of household heads) more likely to report reductions in earnings in this time period. Thus, a worker who has a primary-school degree and is informally employed as of October 2008 in the sample is 29.2 percentage points more likely to report reductions in income during this time period, compared to someone who is formally employed and holds a higher-education degree.

The interaction terms in the specification (Table 6, Columns 2 and 4) show the heterogeneous impact of the crisis on different types of workers: workers employed informally are 32.1 percentage points more likely to experience lower earnings, with a 100% increase in the crisis proxy at the province level (rate of reduction in non-cash credit available from banks). Therefore, it is possible to observe the heterogeneous impact of the crisis: for workers who are informally employed, there is a level effect as well as a slope effect associated with the crisis whereby the province-level macro-shock causes a higher probability of reduced earnings for such workers (see Table 6, Column 2). In the sample of workers who are also household heads, having a middle-school diploma in the presence of the macro-shock (or with increased intensity of the macro-shock) is associated with lower earnings as well when compared to university graduates, though the coefficient here is only significant at the 90% confidence level (see Table 6, Column 4).

In the change-in-earnings regressions in Table 6, we observe that of all workers in the sample, the crisis has more of an impact on informal workers. The interaction term between the crisis (macro-shock) proxy variable and the dummy variable for being an informal worker takes on a positive and signifi-

cant value. This is likely because, for workers with formal-sector jobs, the severance pay is high, and there is no mechanism for the renegotiation of salaries[5]. Throughout the crisis, therefore, informal workers are more likely to both lose jobs and to get lower pay for the same amount of work, as they are less protected in their jobs[6].

4.2.2 Changes in household expenditures, given the earnings shock at the household level

The probability of a household reducing its food expenditures can in turn be linked closely to the earnings shock at the household level. This is demonstrated in the results, first in the form of a maximum likelihood *probit* regression.

Probit results

The results of the empirical specification provided in Equations 5 and 6 are given in Table 7 for the three categories of expenditures (i) food, (ii) education, and (iii) health expenditures. The dependent variables in these *probit* regressions are the dummy variables for reducing expenditures on these items in the first five months of 2009, compared to the first five months of 2008[7]. The first two columns of the table provide findings for the dependent variable on reducing food expenditures. In these regressions, the coefficient on the dummy variable for the reduction in earnings for the household head, denoted by β_1 in Equation 5, takes the value of 0.152 ($p < 0.01$) when controlling for the urban/rural location of the household, household-head educational status, and household-asset index. In other words, a household where the household head experiences an earnings shock (between October 2008 and May 2009) is 15.2 percentage points more likely to reduce its expenditures on food in the first five months of 2009, compared to the same period a year earlier, and in

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5 Note that Turkey has one of the most generous severance-pay mechanisms in the world, as ranked by Holzmann et al. (2011).

6 Also note that informality is more common among women in Turkey: only 9% of women employed were formally employed in 2010, while about 37% of men were in formal employment (Source: Turkey Labor Force Survey 2010, for workers ages 15+). When we limit the sample to household heads who are workers, rather than all workers, we get more of the male workers in the sample, as household heads are predominantly men. Consequently, it becomes more difficult to observe in the data the heterogeneous impact of the crisis on informal workers when we look at household-head workers only.

7 Turkey experienced positive inflation through the time period analyzed. Hence, the households that reported no change in "expenditures" on a certain item should actually be experiencing a "reduction" in consumption (in terms of the quantity of the good consumed). In this sense, the estimates reported are an "underestimate" of the impact of the macro-shock on changes in consumption.

Table 7. Changes in Food, Education, Health, and Durables Expenditures -
Reporting marginal effects from Probit Regressions
(Refer to equations (5) and (6) in empirical specifications)

VARIABLES	Reduced food expenditures		Reduced education expenditures		Reduced health expenditures	
	(1)	(2)	(3)	(4)	(5)	(6)
Lower earnings	0.152***	0.143***	0.009	0.016	0.028	0.025
	(0.034)	(0.034)	(0.019)	(0.018)	(0.028)	(0.028)
Urban location	-0.081*	-0.011	0.021	0.041	0.041	0.019
	(0.046)	(0.079)	(0.030)	(0.052)	(0.033)	(0.041)
Educ: Illiterate or no schooling	-0.062	-0.215	0.054	0.071	-0.001	-0.001
	(0.111)	(0.135)	(0.052)	(0.072)	(0.062)	(0.082)
Educ: Primary School	0.124**	0.035	0.066**	0.098***	0.047	0.052
	(0.052)	(0.059)	(0.031)	(0.035)	(0.033)	(0.040)
Educ: Junior or Senior High School	0.091*	0.040	0.042	0.049	0.046	0.037
	(0.052)	(0.056)	(0.029)	(0.034)	(0.031)	(0.037)
Asset Index	-0.061***	-0.095***	-0.010	-0.006	-0.026*	-0.018
	(0.020)	(0.024)	(0.011)	(0.013)	(0.014)	(0.019)
Earnings shock X Urban		-0.031		-0.006		0.059
		(0.106)		(0.073)		(0.075)
Earnings shock X Illiterate or no schooling		0.165		-0.150		-0.028
		(0.190)		(0.107)		(0.128)
Earnings shock X Primary School		0.114		-0.161***		-0.019
		(0.124)		(0.057)		(0.072)
Earnings shock X Junior or Senior High School		0.069		-0.054		0.034
		(0.119)		(0.057)		(0.075)
Earnings shock X Asset index		0.059		-0.025		-0.031
		(0.036)		(0.019)		(0.027)
Number of children in HH younger than age 15 (age <=14)		0.031*		0.009		0.004
		(0.016)		(0.008)		(0.010)
Number of adults in HH (age >14) (non-children)		0.046***		0.021***		0.008
		(0.014)		(0.007)		(0.011)
Observations	1,163	1,163	1,163	1,163	1,163	1,163

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

comparison to households with similar characteristics but where the household head does not get an earnings shock[8].

As the level of the asset index increases (and the household becomes wealthier), the probability of lowering expenditures on food declines (Column 1). Households where the household head only holds a primary- school degree or middle- or high-school degree are more likely to report drops in food expenditures in this time period, compared to household heads with a higher-education degree.

In the second column of results in Table 7, the same specification is run including the interaction terms between household characteristics and the earnings shock, thus including slope effects following Equation 6 in the specification. The coefficient β_1 is 0.143 when controlling for interaction terms[9].

The household-composition variables—number of adults and children in the household—are also positively associated with the probability of lower food expenditures at the household level. The coefficients on interaction terms would indicate the heterogeneous way in which households respond to an income shock at the household level. The coefficients on these variables (β_3) are generally not significant, although the level effects associated with the asset index and low levels of education remain significant. This suggests that the poor are more likely to lessen their food consumption overall in this time period. However, the existence of the income shock at the household level does not necessarily bring about different probabilities of reducing food expenditures for different types of households. On the other hand, the earnings shock is not associated in these *probit* regressions with reduced levels of expenditures on health and education (represented in Table 7, Columns 3-6). In

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[8] The definition of the earnings shock at the household level included both lower earnings in the current job, as well as a shock to earnings as a result of a job loss. In order to see how a job loss may be differently associated with the changes in food expenditures, separate regressions with different earnings-shock variables were also run. When the earnings shock is defined only in terms of a job loss, this impacts only 2.4% of household-head workers in the sample, while a reduction in earnings in the current job impacts 32.7% of household-head workers. The sample for which we observe a job loss is very small, and this variable does not take on a significant coefficient in the regressions. On the other hand, the coefficient on the earnings shock resulting from lower earnings in the current job (14.1 with p-value < .01) is very similar to the original coefficient on the earnings-shock variable (which was 14.3 with p-value < 0.01 in Table 7).

[9] The model here may contain a number of equations, and the error terms across the equations may be correlated, since spending decisions are jointly decided. As a robustness check, a seemingly unrelated regression (SUR) system with food, education, health, and durables expenditures is set up whereby decisions on these expenditures are made concurrently. The results are robust to this estimation: the coefficient on the earnings shock changes from 14.3 (p-value < 0.01) to 13.7 (p-value < 0.01).

households where the household head only holds a primary- or middle- or high-school degree, compared to a higher-education (university) degree, there is a higher likelihood of reducing education expenditures through this time period. However, in the wake of an income shock, these groups are less likely to reduce education expenditures in comparison to households where the household head holds a university degree.

2SLS and IVprobit estimation results

Next, the paper implements a 2SLS instrumental-variables estimation (as described in Equation 7 of the empirical specification) in order to get more consistent results for the coefficient for the earnings-shock impact on changes in expenditures on food and other items. As described in the empirical-strategy section, one may suspect two types of problems leading to inconsistency in the results: first, in the *probit* results, the responses to the reduction-in-expenditures questions and the income/earnings questions in the survey may be correlated as a result of people's *aversion to cognitive dissonance* and their desire to be consistent in their responses to the survey. Second, given that changes in earnings are not objectively measured and that they are subjective-recall questions asking the household to evaluate changes to their expenditures, there may be significant errors in the measurement of the earnings shock, leading to "attenuation bias" in the coefficient β_1 in Equation 5.

The 2SLS specification given in Equation 7 is provided in Table 8. The coefficient on the predicted probability of having reduced earnings at the household level (φ_1) is significant in the regressions, where only intercept effects are controlled for (as in Equation 7). The 2SLS results where the dependent variable is the dummy variable for reducing food expenditures are reported in Column 1 of Table 8 with robust standard errors. The coefficient on the predicted probability of lower earnings in the household is 0.333 (p value < 0.1), meaning that an earnings shock in the household increases the probability of reducing food expenditures by 33.3 percentage points. In Column 2 of Table 8, the same specification is run using an IV*probit* estimator, which is a more suitable functional form, given that the dependent variable in the regressions (reduction in various expenditures categories) is defined as binary. The marginal-effects coefficient for (φ_1) in the IVprobit estimation is 0.33 (p value < 0.1) with robust standard errors.

The asset index in these instrumental-variables estimations again takes on a large and highly significant coefficient, indicating that the initial wealth level of the household is important in determining the probability of reduction in food expenditures. The size of the coefficient for the earnings shock at the household level using the 2SLS and IVprobit estimations (φ_1) is higher than

Table 8. Changes in Food, Education, and Health Expenditures (IV Regressions - Marginal Effects)

(Refer to equation (7) in empirical specification)

	Reduced food expenditures			Reduced education expenditures			Reduced health expenditures		
	(1) 2SLS	(2) IV *Probit* mfx	(3) First stage results	(4) 2SLS	(5) IV *Probit* mfx	(6) First stage results	(7) 2SLS	(8) IV *Probit* mfx	(9) First stage results
Lower earnings	0.333*	0.330*		0.005	-0.001		-0.071	-0.070	
	(0.193)	(0.170)		(0.114)	(0.136)		(0.124)	(0.114)	
Urban location	-0.032	-0.028	-0.232***	0.021	0.018	-0.233***	0.015	0.012	-0.234***
	(0.081)	(0.081)	(0.058)	(0.046)	(0.050)	(0.058)	(0.050)	(0.051)	(0.058)
Educ: Illiterate or no schooling	-0.120	-0.113	0.175*	0.044	0.057	0.175*	0.017	0.029	0.175*
	(0.103)	(0.105)	(0.095)	(0.064)	(0.066)	(0.095)	(0.066)	(0.075)	(0.095)
Educ: Primary School	0.068	0.076	0.207***	0.058*	0.069	0.207***	0.064	0.073	0.207***
	(0.065)	(0.070)	(0.043)	(0.035)	(0.044)	(0.043)	(0.042)	(0.048)	(0.043)
Educ: Junior or Senior High School	0.056	0.066	0.115***	0.030	0.043	0.115***	0.050*	0.059	0.115***
	(0.048)	(0.055)	(0.040)	(0.025)	(0.034)	(0.040)	(0.030)	(0.037)	(0.040)
Asset Index	-	-0.069***	0.053***	-0.010	-0.010	0.053***	-0.021	-0.021	0.052***
	(0.020)	(0.019)	(0.017)	(0.011)	(0.012)	(0.017)	(0.013)	(0.014)	(0.017)
Crisis proxy at province level			0.298***			0.310***			0.319***
			(0.100)			(0.117)			(0.098)
Labor status of worker: Informal			0.156***			0.153***			0.151***
			(0.035)			(0.041)			(0.038)
Constant	0.276***		0.285***	0.088*		0.283***	0.148**		0.281***
	(0.067)		(0.022)	(0.040)		(0.025)	(0.044)		(0.022)
Observations	1,163	1,163	1,163	1,163	1,163	1,163	1,163	1,163	1,163
R-squared	0.029			0.008					

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

the size of the coefficient in the *probit* estimations β_1. This suggests that the attenuation bias resulting from measurement error dominated the direction of the bias in the maximum-likelihood *probit* results presented in Table 7. The same specification as in Equation 7 is run for education and health expenditures in Columns (4-9) of Table 8, and 2SLS and IVprobit results are presented with the first-stage regressions. None of the earnings-shock variables are significant in these regressions, once again establishing that the income shock did not lead to a reduction in education or health-care expenditure for the households.

Tests of exclusion restrictions

Several tests are reported here documenting the performance of the instrumental variables used in the analysis:

Testing for the relevance of the instruments: In order to test the relevance of instruments, we need to establish that the instrumental-variables matrix is correlated with the earnings shock at the household level, formally $E(Z'Y) \neq 0$. The first-stage results (reported in Table 7, Column 3) suggest that both of the instruments are highly correlated with the earnings-shock variable at the household level. The partial correlation coefficient of the crisis proxy is 0.298 (with p-value < 0.01), and the partial correlation coefficient on the informal labor status of the household head is 0.156 (with p-value < 0.01) in the first-stage regressions (with robust standard errors). The F test of excluded instruments has the value 16.14 in the 2SLS regression, which is above the rule-of-thumb value of 10 and allows us to reject the hypothesis of weak instruments.

Testing for the validity of the instruments: To establish the validity of the instruments, we need to show that the instrumental-variables matrix is uncorrelated with the error term, $E(Z'u)$. In other words, the only way the instruments can influence the outcome variable (changes in expenditures) is through their impact on change in earnings. The exclusion restriction can be tested, since there are more excluded instruments than endogenous regressors in this overidentified model. The Sargan statistic (implemented under the assumption of i.i.d. errors) fails to reject the validity of the excluded instruments: the Sargan statistic has a value of 0.396 and has a Chi2 (1) distribution with a p-value of 0.5292 in the 2SLS results[10]. Alternatively, to drop the i.i.d. assumption, we

[10] The Sargan test statistic is computed using the estat overid command after the 2SLS estimation using ivregress in STATA. The test of overidentifying restrictions regresses the residuals from the 2SLS regression on all instruments in Z. Under the null hypothesis that all instruments are uncorrelated with u, the test has a large-sample Chi2(r) distribution, where r is the number of overidentifying restrictions, in this case 1.

run the Hansen's test (following a GMM estimation of the same model)[11]. The Hansen's J test statistic here is chi2 (1) = 0.387839 (p-value = 0.5334), once again *failing to reject* the null hypothesis that the instruments are valid. The rejection of the null hypothesis in the Hansen-Sargan test could be interpreted as at least one of the instruments being invalid.

Testing for endogeneity: Next, we implement a test of the endogeneity of the earnings-shock variable in the *probit* regressions of Equation 5. Under the null hypothesis that the earnings-shock variable is exogenous, the robust Durbin-Wu-Hausman test[12] is implemented and gives a p value of 0.307. The test fails to reject the null hypothesis that the earnings-shock variable in the regular OLS regressions is exogenous. While the endogeneity of the earnings shock in the model is now less of a concern, there is still a strong concern related to the measurement error in the earnings-shock explanatory variable in Equation 5; for that reason, using the 2SLS estimation to get consistent estimates of the coefficient on the earnings shock is still a suitable strategy.

Testing for underidentification: This test is essentially the test of the rank of a matrix. Under the null hypothesis that the equation is underidentified, the Anderson canon. corr. LM statistic has a value of 31.6. Under the null, the statistic is distributed as Chi2 (2), and we can reject the null hypothesis indicating that the model is identified with p-value equal to zero. The rejection of the null indicates that the matrix is full-column rank and that the model is identified.

4.3 Robustness Checks

The results on changes in food-expenditure patterns are also robust to different dependent variables that describe food-consumption behavior. Robustness checks for the same empirical specification as in Equation 7 are run using four different dependent variables in this section of the analysis, still revealing a strong link between the income shock at the household level and the changes in food-consumption levels[13].

The results of the 2SLS and IVprobit regressions with food-consumption-dependent variables are provided in Table 8. The results (following specifica-

[11] Hansen's test is implemented with the post-estimation estat overid command following the ivregress gmm command for an overidentified model.

[12] The Durbin-Wu-Hausman test is implemented using the post-estimation command estat endogenous following the 2SLS estimation using ivregress.
Durbin-Wu-Hausman F(1,1155) = 1.04429 (p = 0.3070)\par.

[13] The dependent variables in this section of the analysis are based on the coping-mechanisms module of the survey, where households are asked if they have had to change certain behavioral patterns between October 2008 and May 2009 to cope with the crisis.

tion in Equation 7) show that households that face an earnings shock in this time period also have a higher likelihood of "reducing food consumption," "substituting into cheaper food items," and "reducing the amount of food provided to children." A shock to the earnings of the household head is associated with a 79.8-percentage-point (p value < 0.01) increase in the probability of "reducing food consumption" and a 45.2-percentage-point (p value < 0.05) increase in the probability of "reducing the food amount provided to children" in the 2SLS estimation when controlling for household characteristics such as urban/rural location, educational attainment of the household head, and the asset index. Urban households and households with a lower asset index have a higher likelihood of changing food consumption behavior in these regressions. These households also report substituting into cheaper food items with a 55.1-percentage-point higher probability (p value < 0.01). The asset index takes on a highly significant and large partial correlation coefficient in these 2SLS regressions, with a one-unit increase in the asset index being associated with a 14.2-percentage-point rise in the likelihood of reducing food consumption, and a 14.9-percentage-point uptick in the likelihood of reducing the amount of food provided to children (both with a p-value < 0.01)[14]. The IVprobit marginal-effects results are provided in the same table for comparison with 2SLS results.

Finally, the 2SLS and IVprobit estimations using Equation 7 are provided for these education and health utilization variables. The 2SLS results show no apparent link between the earnings shock and changes in education enrollments, while there is a strong association between the earnings shock and reduced health-care utilization of curative care at the household level[15].

These regressions show that an earnings shock at the household level is associated with no change in educational enrollments or use of preventive health-care services (though there is some reduction in the utilization of curative health-care services after an income shock). In general, though, when dealing with an income shock, households are less likely to change their consumption of education and preventive health-care services than they are to adjust their consumption of food. The reduction in demand for these mostly publicly-provided services (that already made up a small share of the house-

[14] Note that the asset index takes on values between 1 and 7.73 in the sample. Hence, between the poorest and richest households in terms of assets, there is a 6.73-unit difference in the measurement of the asset index.

[15] The results are robust to an IVProbit estimation using Newey's minimum chi-squared estimator with the two-step option. In fact, the income shock gets an even higher coefficient (0.878 with p-value < 0.10) in the two-step IVProbit regression (not reporting marginal effects) compared to 0.861 (with p-value < 0.10) in the regular IVProbit estimation.

hold budgets in the baseline, Table 1) was smaller than the reduction in demand for food throughout this time period.

Further robustness checks were run using different definitions for the income-shock variable, such as (i) the proportion of breadwinners in the household as the income-shock variable at the household level, and (ii) a dummy variable that takes the value of 1 if anyone in the household has received an earnings shock (rather than just the household head). The findings with regard to changes in food consumption are robust to these different specifications of the income-shock variable. When the earnings shock is defined as at least one individual in the household experiencing lower earnings since October 2008, this variable is associated with an 8.9-percentage-point jump in the likelihood of reduction of food expenditures. When the variable is defined as "the proportion of breadwinners in the household reporting lower incomes," then a 100% increase in this variable is associated with a 10.6-percentage-point run-up in the probability of decreasing food expenditures. Both of these coefficients are statistically significant (with p-values < 0.01); however, the size of the coefficients under these definitions is lower than when the earnings shock is defined as the household head worker receiving a shock to his earnings.

5. Conclusion

Food expenditures, which as of 2008 made up 44% of the household budget for the poorest expenditure decile, acted as the main adjustment mechanism for those reeling from the income shock in Turkey, while education and health expenditures remained relatively stable. Households managed to cut down on their spending on food either by substituting into cheaper food products or, directly, by reducing their consumption of food. About 71% of the households in the sample reported substituting consumption into cheaper food items, and 57% reported directly decreasing the amount of food consumption. In parallel, 24% of the households reported reducing the amount of food provided to children in the survey period. The income shock at the household level was associated with a decline in food consumption and expenditures, while education and health-care utilization were more protected, even with the backdrop of an economic crisis.

In the maximum-likelihood *probit* regressions, the dummy for the income shock to household earnings is associated with a 16.2-percentage-point increase in the probability of reporting reduced expenditures on food between October 2008 and May 2009. Due to measurement error in the earnings-shock explanatory variable in these regressions, though, there is likely to be attenuation bias in the maximum-likelihood *probit* results. This bias is corrected with

a 2SLS and IVprobit strategy, which consistently estimates the probability of reduction in food consumption. In the aftermath of an income shock, the probability of reducing food expenditures goes up by 33.3 percentage points, and the probability of reducing food consumption soars 79.8 percentage points in the 2SLS model. The probability of "reducing the amount of food provided to children" is raised by 45.2 percentage points after a shock to the earnings of the household head. Through the period analyzed in the survey, the probability of reducing food consumption is highest among those poor that initially had low levels of household assets. While food expenditures and consumption provide the main buffer for households affected by the crisis, there is little or no change in the education and health expenditures of households, and the educational enrollment of children or the utilization of preventive health-care services after having sustained an income shock at the household level remains stable.

Given that food consumption was the main buffer for these households between them and the trauma of the income shock and, as a result, we see the amount of food provided to children being reduced, it may be possible to consider in times of such crises to expand in-kind distribution of food to children through school feeding programs for a limited time period. Such programs could be an effective social safety net, reducing the medium- to long-term negative effect of the crisis on children's nutrition and physical/cognitive development, while also having a beneficial impact on school analysis rates (Bundy and Grosh, 2009). However, such programs can also be highly costly and administratively burdensome, so it is important to ensure they are designed in a cost-effective and sustainable way, perhaps with a time limit, i.e., the duration of the macro-shock.

The analysis in the paper can be expanded in several ways in order to better analyze policy options. First of all, one could look at whether there have been changes to household assets over time as a result of the income shock. While consumption may serve as a buffer against the earnings shock in the short term, households may only begin to run down their assets in the medium term if the earnings shock persists (Fafchamps et al., 1998). The second round of the Turkey Welfare Monitoring Survey was collected as a panel survey in December 2009 (with retrospective questions going back to May 2009), and these data (following the same households over time) would enable us to answer questions regarding the changes in assets where the income shock persists for several months. The household-assets module, as well as the module on household savings and debt in this survey questionnaire, would be invaluable inputs for researching the medium-term impact of the crisis on household assets.

A second way in which the analysis in this paper might be expanded would be to work with the safety-nets module in the data set. Such further analysis would be quite descriptive in nature, though interesting nonetheless, considering all the detailed information available on the household's access to safety nets through public and private means. For instance, each household reports whether during difficult times they would be able to borrow from friends and relatives, and whether they have utilized this informal safety net in the past.

A preliminary analysis of this module shows that informal safety nets (involving friends and family networks) are quite strong in the Turkish context, with 20.6% of households in the sample reporting they increasingly borrowed from friends and relatives and 7.4% saying they increasingly received help from friends and relatives during the crisis.

In contrast, the Turkish public safety net is quite weak, with only 1% of households in the sample accessing social-protection funds provided by the government and municipalities in the same time period. This preliminary analysis of the safety-nets module also suggests that households that had access to informal safety nets had a lower probability of reducing (food) consumption during the crisis, even with the presence of an income shock. This finding indicates that the informal safety net in Turkey may have been effective in *delinking* the income shock at the household level from changes in consumption and welfare. Thus, in a separate paper, it would be worthwhile to further analyze these data on the use of informal safety nets in Turkey during the crisis and the effectiveness of such networks for reducing the welfare impact of the crisis on households.

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Housing, Collateral Constraints, and Fiscal Policy

Hamza Polattimur[*]

Abstract

This paper studies the preferential tax treatment of housing that can be observed in many industrialized countries. It provides a rationale for it by means of an optimal taxation approach, taking into account an important feature of housing, namely its usage as collateral. In a borrower-lender framework, where private loans are assumed to be non-enforceable and have to be collateralized by housing, optimal fiscal policy should disburden constrained borrowers by subsidizing their housing.

JEL Codes: E44, H21, R21.

Keywords: Housing, collateral constraints, optimal fiscal policy

[*] TU Dortmund University, Department of Economics, Vogelpothsweg 87, 44227 Dortmund, Germany. Phone: +49 231 755 7966. Email: hamza.polattimur@udo.edu
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1. Introduction

Housing is subject to a preferential tax treatment in many industrialized countries. In the US, total housing subsidies added up to $220 billion in 2011, corresponding to 1.5% of GDP (US Budget, 2011). Also, in various European countries, the values of total housing subsidies expressed in percent of GDP were in that range: e.g., 0.9% in Germany, 1.1% in France, and 1.4% in Spain in 2000 (ECB, 2003).

The two most important housing subsidies are the deductibility of mortgage interest payments from income and the tax exemption of imputed rents on owner-occupied housing. In the US, the former amounted to $105 billion while the latter added up to $38 billion in 2011 (US Budget, 2011). These two subsidies accounted for 65% of total housing subsidies.

However, among economists, this preferential tax treatment of housing is controversial. On the one hand, it is criticized by researchers like Poterba (1992) and Gervais (2002), among others, who argue that this favoritism leads to a welfare loss, since it distorts investment decisions of individuals towards housing. These studies are in line with Rosen, who argues that "paternalism and political considerations seem to be the sources of this policy" (1985, p. 380).

On the other hand, there are proponents of this treatment who argue that homeownership is accompanied by externalities that are internalized through these subsidies. For instance, Green and White (1997) stress the positive impact of homeownership on the education of children, and DiPasquale and Glaeser (1999) state that homeowners are better citizens in the sense that they are more involved in local organizations.

In contrast to these papers, this work gives a rationale for housing subsidies based on market imperfections. We assume that private loans are not enforceable and therefore have to be collateralized by housing. Furthermore, the data make clear the importance of housing as a component of wealth and the relevance of its usage as collateral. First, housing makes up a large part of total household wealth as well as total national wealth. In the US, the value of housing accounts for half of total household wealth and is larger than annual GDP, with an average ratio of housing wealth to GDP of about 1.5, from 1952 to 2008 (Iacoviello, 2009). Secondly, in 2010, residential mortgage debt amounted to 77% of GDP in the US and to 47% in Germany, to 41% in France, and to 64% in Spain (Hypostat, 2010). To the best of our knowledge, this paper is the first one that studies optimal taxation of housing in the presence of collateral constraints.

The structure of the model is as follows. We consider a household sector that relates to Kiyotaki and Moore's (1997) model with two types of agents who differ in their discount factors, patient and impatient ones. Due to this difference in patience, we get lenders, the patient agents, and borrowers, the impatient ones, in equilibrium. While for the former the collateral constraint is irrelevant in equilibrium, it is of importance for the latter. As in Iacoviello (2005), housing plays a dual role for households. First, it delivers utility together with consumption and leisure, and, secondly, private loans are collateralized by housing. The government is assumed to have exogenous expenditures that have to be financed by two taxes, a housing property tax (which can differ for the two types of agents) and a labor income tax. The different housing tax rates for the two types can be understood as follows. The patient households for whom the collateral constraint is irrelevant will always own larger houses than the impatient ones and therefore are taxed at another, higher, rate than the impatient and hence wealth-poor agents.

The main thrust of this paper is to provide a rationale for housing subsidies. In the presence of collateral constraints, optimal fiscal policy should subsidize the housing of impatient households, for whom the collateral constraint is relevant, in order to disburden them. This subsidy has to be financed to the largest extent by a housing tax on patient households and to a smaller part by a labor income tax. In other words, this can be interpreted as redistribution from wealth-rich patient households owning larger houses to wealth-poor impatient households who own smaller houses.

The main result of housing subsidies for impatient households is robust for several parameter variations and can be attributed for the most part to the collateral constraint. To illustrate this point, we analyze the effects of the discount-rate difference between the types of agents on housing subsidies in comparison to the effects of the collateral constraint, and we find that the former plays a minor role.

We also consider a representative-agent version of the model as a reference case. We thereby understand how the inclusion of a durable good, housing *per se*, affects optimal fiscal policy compared to standard models. Furthermore, this allows us to compare the results of the representative-agent version to existing literature. These results are, in fact, quite intuitive and in line with the principle of optimal taxation: namely, goods with lower elasticities should be taxed at a higher rate. For the benchmark calibration, the housing tax rate is positive in the representative-agent version, as it is for patient households in the model with two types of agents.

The paper further relates to the work of Eerola and Määttänen (2009), which considers optimal taxation of housing in a dynamic representative-agent model with fairly general preferences and an extended tax system, compared to the model of this paper. However, the results of the representative-agent version of our model are compatible with their results. Another closely related paper is that of Monacelli (2008), who considers a model with two types of agents with different patience rates and collateral constraints similar to the one of this paper. While Monacelli analyzes optimal *monetary* policy in that framework, he also points out that the analysis of optimal fiscal policy in such a model would be of interest, which is done in this paper.

The rest of the paper is organized as follows. In Section 2, the model with two types of agents, firms, and the government is described, the Ramsey problem is set up, and the equilibrium conditions for the steady state are derived. In Section 3, the results for the full as well as the representative-agent version are presented, and a sensitivity analysis is given. The fourth and last section presents the conclusion.

2. The Model

In this section, we present the model with a household sector consisting of two types of agents, a production sector consisting of two types of firms, and the government. Concerning the household sector, we follow Kiyotaki and Moore (1997), who pioneered the models with two types of agents, patient and impatient ones, resulting in an equilibrium with lenders and borrowers. We assume that private debt contracts are not enforceable and have to be collateralized by housing, as in Iacoviello (2005). Therefore, a head of household can only borrow up to a fraction m of his expected end-of-period housing wealth. Additionally to its usage as collateral, housing delivers utility together with consumption and leisure.

As in Favilukis et al. (2012), we consider a two-sector production side, such that both housing demand and supply are modeled explicitly. There are two types of firms, one of which produces non-durable consumption goods and the other durable housing.

The government levies a flat-rate tax on labor income and a housing property tax that can differ for the two types of agents and issues one-period bonds to finance an exogenous stream of government expenditures. It has no access to lump-sum taxes. The reason why housing tax rates can differ is that a patient household will own a larger house than an impatient one. Hence, rather than taxing degrees of patience differently, we can understand this as taxing the ones with a larger house at a higher rate than the ones with a smaller

house. Due to the usage of housing as collateral, which is only relevant for the borrowers, who will be the impatient agents in equilibrium, we will see that the housing tax rates will differ markedly.

2.1. Households

There is a continuum of households consisting of two types, patient and impatient ones. They differ in their discount factors $1 > \beta > \beta' > 0$, with β being the discount factor of patient and β' of impatient households. Henceforth, variables of patient (impatient) households are denoted without (with) a prime, while aggregate variables are denoted with a superscript T (e.g. c_t^T, for total consumption). The population share of patient households is s. Borrowing between the two types of households is modeled as follows. A household can borrow an amount $-\frac{b_t}{1+r_{t-1}}$ in period $t-1$ and has to pay back $-b_t$ in period t, where r_{t-1} is the real interest rate on loans between $t-1$ and t. Since we assume that private debt contracts are not enforceable, there is a limit on private debt, given by a fraction m of the expected end-of-period housing wealth

$$b_{t+1}^{(\prime)} \geq -mp_{h,t+1}h_t^{(\prime)}, \tag{1}$$

where m denotes the exogenous pledgeable fraction of housing. As we will see below, this constraint will become relevant for impatient households, while it will be irrelevant for patient ones.

Both types of households derive utility from consumption $c_t^{(\prime)}$ and housing $h_t^{(\prime)}$ and disutility from labor $n_t^{(\prime)}$ and maximize the infinite sum of expected utility. Their objective is given by

$$\sum_{t=0}^{\infty} \beta^{(\prime)t} u(c_t^{(\prime)}, h_t^{(\prime)}, n_t^{(\prime)}). \tag{2}$$

We consider the following CRRA-specification of the utility function

$$u(c_t, h_t, n_t) = \frac{c_t^{1-\mu^c}}{1-\mu^c} + \frac{h_t^{1-\mu^h}}{1-\mu^h} - \frac{n_t^{1+\mu^n}}{1+\mu^n}, \tag{3}$$

where $\mu^{c(h)}$ denotes the inverse of the intertemporal elasticity of substitution in consumption (housing) and μ^{n} the inverse of the Frisch elasticity of the labor supply.

2.1.1 Patient households

The representative patient household generates income from working $w_t n_t$, with w_t being the real wage rate and the return of bond holdings b_t^g. Labor income is taxed at the rate τ_t^n. Every period the household can adjust its stock of housing according to $h_t - (1-\delta_h)h_{t-1}$ at the price of housing $p_{h,t}$, with δ_h being the depreciation rate of housing. The value of the housing stock owned by the household is taxed at the rate τ^h. Thus, we consider a housing property tax that is proportional to the value of the current housing stock and is paid every period. The budget constraint of the patient households is given by

$$\begin{aligned} & c_t + p_{h,t}\left[\left(1+\tau_t^h\right)h_t - (1-\delta_h)h_{t-1}\right] + \frac{b_{t+1}^g}{R_t^g} + \frac{b_{t+1}}{R_t} \\ & = \left(1-\tau_t^n\right)w_t n_t + b_t^g + b_t, \end{aligned} \tag{4}$$

where c_t denotes consumption spending, $\frac{b_{t+1}^g}{R_t^g}$ investment in new government bonds with the relating gross interest rate $R_t^g = 1 + r_t^g$ and b_t privately issued debt with the gross interest rate $R_t = 1 + r_t$. The patient household will hold positive amounts of $b_t^g > 0$ and $b_t > 0$ and hence will be the lender in equilibrium. That's why the collateral constraint (1) will be irrelevant for patient households: $b_{t+1} > 0 > -mp_{h,t+1}h_t$.

2.1.2 Impatient households

The budget constraint of the representative impatient household analogously reads

$$c_t^{'} + p_{h,t}\left[\left(1+\tau_t^{'h}\right)h_t^{'} - (1-\delta_h)h_{t-1}^{'}\right] + \frac{b_{t+1}^{'g}}{R_t^g} + \frac{b_{t+1}^{'}}{R_t} = \left(1-\tau_t^n\right)w_t n_t^{'} + b_t^{'g} + b_t^{'}. \quad (5)$$

Since we rule out short sales in government bonds, the impatient households will set $b_{t+1}^{'g} = b_t^{'g} = 0$. Furthermore, this type will be the private borrower in equilibrium, i.e., $b_{t+1}^{'} = -\frac{s}{1-s}b_{t+1} < 0$, following from the market-clearing condition for private debt $(1-s)b_{t+1}^{'} + sb_{t+1} = 0$. Hence, the collateral constraint (1) will become relevant here. Therefore, there is a limit on the obligations of impatient households, which is given by $b_{t+1}^{'} \geq -mp_{h,t+1}h_t^{'}$.

2.2 Government

The government levies a flat-rate tax on labor income τ_t^n and a housing property tax $\tau_t^{(')h}$ and issues one-period bonds ($b_t^{(')g} \geq 0 \quad \forall t \geq 0$) to finance an exogenous stream of government expenditures (g_t):

$$g_t - \frac{b_{t+1}^g}{R_t^g} + b_t^g = s\tau_t^h p_{h,t}h_t + (1-s)\tau_t^{'h} p_{h,t}h_t^{'} + \tau_t^n w_t n_t^T, \quad (6)$$

where $n_t^T = sn_t + (1-s)n_t^{'}$ denotes total labor supply. As mentioned before, the different housing tax rates τ_t^h and $\tau_t^{'h}$ can be understood as taxing the wealthier agents, which will be the patient households in equilibrium, at a rate that differs from the one for the wealth-poor impatient households, which will own smaller houses in equilibrium.

2.3 Firms

The production side of the economy is characterized by two sectors, one of which produces consumption goods y_c and the other housing y_h. In both sectors, there is a continuum of firms, which are assumed to produce with the same technology for simplicity's sake. The representative firm of each sector produces its output with labor according to $y_{c,t} = n_{c,t}^T$ and $y_{h,t} = n_{h,t}^T$, where total labor input in each sector is given by the weighted sum of labor input of the patient and impatient households in this sector $n_{c,t}^T = sn_{c,t} + (1-s)n_{c,t}^{'}$

and $n_{h,t}^T = sn_{h,t} + (1-s)n_{h,t}^{'}$. On the other hand, total labor supply $n_t^T = sn_t + (1-s)n_t^{'} = n_{c,t}^T + n_{h,t}^T$ is divided between the two types of firms. Labor is assumed to be totally mobile between the two sectors, leading to a wage rate that is the same for both sectors.

2.4 Competitive Equilibrium

We now describe the competitive equilibrium of the private sector and then set up the Ramsey problem.

Patient households

A patient household chooses the values of c_t, h_t, n_t, b_{t+1}^g and b_{t+1} to maximize (2), subject to the budget constraint (4), leading to the first-order conditions

$$h_t^{-\mu^h} = (1+\tau_t^h) p_{h,t} c_t^{-\mu^c} - \beta c_{t+1}^{-\mu^c} (1-\delta_h) p_{h,t+1} \quad (7)$$

$$n_t^{\mu^n} = (1-\tau_t^n) w_t c_t^{-\mu^c} \quad (8)$$

$$c_t^{-\mu^c} = \beta R_t^g c_{t+1}^{-\mu^c} \quad (9)$$

$$c_t^{-\mu^c} = \beta R_t c_{t+1}^{-\mu^c}. \quad (10)$$

Equation (7) describes housing demand. In the optimum, the marginal utility of current housing $h_t^{-\mu^h}$ equals the marginal utility of foregone consumption $c_t^{-\mu^c}$ at the gross price of housing $(1+\tau_t^h) p_{h,t}$ less the discounted marginal utility of next period's consumption $\beta c_{t+1}^{-\mu^c}$ achieved from selling the house after depreciation $(1-\delta_h)$ at the price $p_{h,t+1}$. Equation (8), which is fairly standard, describes the labor supply of a patient household and equates the marginal rate of substitution between consumption and leisure $\frac{n_t^{\mu^n}}{c_t^{-\mu^c}}$ to the net real wage rate $(1-\tau_t^n) w_t$. Equations (9) and (10) are Euler equations with respect to public and private lending.

Impatient households

An impatient household chooses the values of $c_t^{'}$, $h_t^{'}$, $n_t^{'}$ and $b_{t+1}^{'}$ to maximize (2), subject to the budget constraint (5) *and* the collateral constraint (1), leading to the first-order conditions

$$h_t^{'-\mu^h} = \left(1+\tau_t^h\right) p_{h,t} c_t^{'-\mu^c} - \beta' c_{t+1}^{'-\mu^c} \left(1-\delta_h\right) p_{h,t+1} + \omega_t m p_{h,t+1} \tag{11}$$

$$n_t^{'\mu^n} = \left(1-\tau_t^n\right) w_t c_t^{'-\mu^c} \tag{12}$$

$$\omega_t = \frac{c_t^{'-\mu^c} - \beta' c_{t+1}^{'-\mu^c} R_t}{R_t} \tag{13}$$

and the complementary slackness conditions

$$\omega_t \left(b_{t+1}^{'} + m p_{h,t+1} h_t^{'}\right) = 0,\ b_{t+1}^{'} + m p_{h,t+1} h_t^{'} \geq 0,\ \omega_t \geq 0.$$

Equation (11) describes the housing demand of an impatient household. The term $\omega_t m p_{h,t+1}$ stems from the collateral constraint, with ω_t being the multiplier on this constraint. Equation (12) is the labor-supply function of an impatient household. Equation (13) is the modified Euler equation resulting from the fact that the impatient household is borrowing constrained. In the steady state, the collateral constraint will be binding, as we can see from (10), which becomes $\frac{1}{R} = \beta$ and (13), leading to $\omega = c^{'-\mu^c}\left(1/R - \beta'\right) = c^{'-\mu^c}\left(\beta - \beta'\right) > 0$. Finally, from the complementary slackness conditions, we get $b' + m p_h h' = 0 \Leftrightarrow b' = -m p_h h'$.

Furthermore, the transversality conditions $\lim_{t\to\infty} \beta^t u_t^c \frac{-b_{t+1}^g}{R_t^g} = 0$ and $\lim_{t\to\infty} \beta^t u_t^c \frac{b_{t+1}^{'}}{R_t} = 0$ must hold, of which the latter is redundant due to the collateral constraint that is more restrictive.

Firms

In both sectors, the representative firm maximizes profits according to $\max_{n_{c,t}^T} \Pi_{c,t} = \max_{n_{c,t}^T} \left(n_{c,t}^T - w_t n_{c,t}^T\right)$ in the final consumption goods sector and $\max_{n_{h,t}^T} \Pi_{h,t} = \max_{n_{h,t}^T} \left(p_{h,t} n_{h,t}^T - w_t n_{h,t}^T\right)$ in the housing sector, leading to the first-order conditions

$w_t = 1$ and $p_{h,t} = 1$.

Aggregate resource constraint

Finally, due to identical production technologies and perfect mobility of labor between the two sectors, the aggregate resource constraint is given by (see Appendix A.1)

$$c_t^T + g_t + p_{h,t} h_t^T = y_{c,t} + p_{h,t} y_{h,t} + (1-\delta_h) p_{h,t} h_{t-1}^T. \quad (14)$$

2.5 The Ramsey Problem

We assume that the government has access to a commitment technology and is able to bind itself to its policy. The government chooses the values of h_t, c_t, n_t, $h_t^{'}$, $c_t^{'}$, $n_t^{'}$ and the tax rates τ_t^h, $\tau_t^{'h}$ and τ_t^n in order to maximize social welfare, subject to the private-sector equilibrium conditions, the resource and the implementability constraint, while financing an exogenous stream of government expenditures $\{g_t\}_{t=0}^{\infty}$. Following Monacelli (2008), in this economy with two types of agents, social welfare is measured by the weighted sum of utility of the two types

$$\sum_{t=0}^{\infty} \beta^t s u(c_t, h_t, n_t) + \beta^{'t}(1-s) u(c_t^{'}, h_t^{'}, n_t^{'})$$

and the aggregate discount rate is defined as $\beta^A = \beta^s \beta^{'(1-s)}$ to be used as the discount rate for the constraints. For the mathematical formulation of the Ramsey problem, see Appendix A.2.1. The first-order conditions of the Ramsey problem and the steady state are derived in Appendix A.2.3.

3. Results

This section presents and discusses optimal taxation results of the model. First, as a natural starting point of the analysis, results for the representative-agent version, which can be derived analytically, will be given. The relation of these results to existing literature on optimal taxation will be discussed. Afterwards, numerical results for the full version of the model will be given and compared with the results of the representative-agent version in order to point out the role of the collateral constraint. Finally, we will compare the role of the difference in discount rates against the role of the collateral constraint and present sensitivity analyses.

3.1 Representative-Agent Version

By setting the discount rate of the impatient agents equal to that of the patient agents, $\beta' = \beta$, the model collapses to a representative-agent version. For this version, we can derive analytical solutions for the steady-state tax rates, which are the labor income tax τ^n and the housing property tax τ^h. For the derivation of the analytical solutions for the representative-agent version, the interested reader is referred to Polattimur (2013).

The optimal steady-state tax rate on labor income is given by

$$\tau^n = \frac{\phi\left(\mu^n + \mu^c\right)}{1+\phi\left(1+\mu^n\right)} > 0 \text{ for } \phi > 0,$$

and is positive for $\phi > 0$. It only depends on the multiplier on the implementability constraint $\phi \geq 0$ and the parameters μ^c and μ^h.

The optimal steady-state tax rate on housing is given by

$$\tau^h = \frac{\phi}{1-\phi} \underbrace{\frac{\mu^h - \mu^c}{\mu^h - 1}}_{(i)} \underbrace{\left(1-\beta\left(1-\delta_h\right)\right)}_{(ii)}. \tag{15}$$

This equation reflects two features of housing: *(i)* can be attributed to the fact that housing delivers utility like consumption and *(ii)* to the durability of housing.

For $\phi > 0$, the sign of the tax rate (related to the question of whether housing should be taxed or subsidized) depends on the parameters μ^h and μ^c. For the sign of τ^h, the term *(ii)* in (15) can be discarded, since $1 - \underbrace{\beta\left(1-\delta_h\right)}_{\in(0,1)}$ is positive. Here, the analysis has to be restricted to values of $\phi < \phi^* = \frac{1}{\mu^h - 1}$, since for larger values the second derivatives become positive, resulting in minima (see Polattimur (2013)).

As mentioned before, the sign of τ^h only depends on the term *(i)* in (15). From principles of optimal taxation, we know that goods with lower elasticities should be taxed at a higher rate. Since we do not consider a consumption tax at all, whether housing should be taxed or subsidized depends on whether

its intertemporal elasticity of substitution is lower or higher than the one of consumption. There are three cases:

1) For $\mu^c = \mu^h$ housing and consumption should be treated identically due to identical intertemporal elasticities of substitution, leading to an optimal tax rate on housing of zero.

2) If the elasticity of housing is smaller than the one of consumption, i.e., $\frac{1}{\mu^c} > \frac{1}{\mu^h} \Leftrightarrow \mu^c < \mu^h$, the optimal housing tax rate is positive.

3) For $\mu^c > \mu^h$ the optimal housing tax rate is negative, since the elasticity of consumption is smaller than the one of housing.

These results are compatible with those of Eerola and Määttänen (2009), who consider a more general representative-agent framework with capital and optimal taxation of capital in addition to housing.

While the term *(ii)* in (15) is irrelevant for the sign of τ^h, it has a large effect on the size of it. For the baseline calibration (see Table 1), for instance, it reduces the housing tax by more than 97%. However, the higher δ_h is, i.e., the lower the durability of housing is, the smaller the impact is of *(ii)* on the size of τ^h. Notice that *(ii)* disappears for the case $\delta_h = 1$, where durability of housing is assumed away and housing fully depreciates within one period.

3.2 Results of the Full Version

Since analytical results are not available for the full version, we consider numerical results for the steady state, where the collateral constraint is binding, as we have seen before in Section 2.4. For comparison, we also give numerical results for the representative-agent version and the baseline calibration.

3.2.1 Calibration

In this section, the baseline calibration of the model is described. Following Iacoviello (2005), one time period is set to one quarter and the discount factor of patient households to $\beta = 0.99$, leading to a steady-state gross real interest rate of *R = 1.01*, which is equivalent to an annual real interest rate of 4%. The discount factor of impatient households is set to $\beta' = 0.95$ by Iacoviello (2005) as a compromise of the estimates given in the literature, which is adopted here. However, in Section 3.3, we will consider a variation in β'

between 0.95 and 0.97 to see how this affects the result. In order to get a wage share of patient households equal to $\frac{swn}{swn+(1-s)wn'} = 0.64$ as in Iacoviello (2005), we set *s = 0.62*, while we will also show in the sensitivity analyses how a variation in population shares alters the results. Moreover, we set the pledgeable fraction of housing to *m = 0.55*, resulting from an estimation of Iacoviello (2005). Hence, an impatient agent can only borrow up to 55% of the value of his house. We will also consider in Section 3.3 how a variation in *m* between 0 and 1, which covers all relevant values for *m*, affects the results. The depreciation rate of housing is set according to Davis and Heathcote (2005), who estimate an annual rate of 1.41%. We thus set $\delta_h = 0.0035$ for a quarter.

In the calibration of the utility parameters μ^c and μ^n, we follow King and Rebelo (1999), who say that the basic RBC model with log utility in consumption implies a labor supply elasticity of 4. Hence, we set $\mu^c = 1$ and $\mu^n = 1/4$, while we will also conduct robustness checks for both of these parameters in Section 3.4.

Since the aim of this paper is to evaluate optimal taxation of housing, the utility parameter of housing μ^h is calibrated in order to match an empirical fact about housing. According to Iacoviello (2009), where some stylized facts about housing are listed and should be matched when calibrating models of housing, total housing wealth was on average 1.5 times as large as annual GDP in the US between 1952 and 2008. Therefore, we set the parameter μ^h in order to match this value. Since in the model one time period is one quarter, and therefore *y* in the notation of the model denotes quarterly GDP, we have to multiply this value by four in order to match the ratio of total housing stock to quarterly GDP of $\frac{h^T}{y} = 6$. This is achieved by setting $\mu^h = 1.75$, leading to an elasticity of $\frac{1}{\mu^h} = 4/7$. In addition, we will also give sensitivity results concerning the parameter μ^h in Section 3.4.

For the calibration of governmental variables *g* and b^g, we use data from the World Bank (2012a, 2012b). In 2010, US general government final consumption expenditures amounted to 17% of annual GDP. Since both government expenditures and GDP are flow variables, the ratio is the same for a time period of one quarter, $\frac{g}{y} = 0.17$. Moreover, US total central government debt made up 76.8% of annual GDP in 2010. Since government debt is a stock

variable, this value again has to be multiplied by four. Hence, the ratio that we have to match in terms of quarterly GDP is given by $\frac{b^g}{y} = 3$. These values of the governmental variables are achieved by setting $g = 0.172$ and $b^g = 3.1$. The baseline parameter calibration is summarized in Table 1.

Given this parameter calibration, we compute the steady state numerically, which delivers the optimal values of consumption, housing, and labor for both types of agents as well as the optimal tax rates τ^h, τ'^h and τ^n.

Table 1. Baseline Parameter Calibration

Description	Source/Target	Parameter	Value
Discount factor patient households	Iaco. 2005	β	0.99
Disc. factor impatient households	Iaco. 2005	β'	0.95
Pledgeable fraction of housing	Iaco. 2005	m	0.55
Depreciation rate of housing	D&H 2005	δ_h	0.0035
Share of patient households	Wage share = 0.64	s	0.62
Inverse of Frisch elasticity	K&R 1999	μ^n	1/4
Inverse of IES in consumption	K&R 1999	μ^c	1
Inverse of IES in housing	$h^T / y = 6$	μ^h	1.75
Government expenditures	$g / y = 0.17$	g	0.172
Government debt	$b^g / y = 3$	b^g	3.1

3.2.2 Numerical results

The results of the full and the representative-agent version for the baseline calibration are summarized in Table 2. Notice that the optimal tax rate on housing in the representative-agent version is close to zero but still positive ($\tau^h = 0.2\%$), while for the full model we get two housing tax rates that both differ markedly from zero. The optimal housing tax rate for patient households is $\tau^h = 1.65\%$, and the one for impatient households $\tau'^h = -2.72\%$. Thus, for the baseline calibration, it is optimal to subsidize housing of impatient/constrained households and to tax patient ones in the full version, while in the representative-agent version housing is taxed at a rate close to zero. The subsidy for impatient households results from the heterogeneity in patience

rates and the collateral constraint, which are absent in the representative-agent version.

To see how this subsidy optimally is financed, we consider the government budget (6) in the steady state

$$g + (1-\beta) b^g = \tau^n n^T + s\tau^h h + (1-s)\tau'^h h'. \tag{16}$$

Expenditures are given by $g + (1-\beta) b^g = 0.203$ and revenues by $\tau^n n^T + s\tau^h h + (1-s)\tau'^h h' = 0.1887 + 0.0668 - 0.0526 = 0.203$. We see that the labor income tax finances government expenditures, while the housing subsidy for impatient households is financed for the most part by a housing tax on the patient households. Therefore, the housing tax rate on the patient households is much larger than the tax rate on housing in the representative-agent version. This point becomes clearer when we consider the case $g = b^g = 0$ (last column of Table 2). For this case, the left-hand side of the government budget (16) is zero, $g + (1-\beta) b^g = 0$ and there is a large decline in the labor income tax rate. On the right hand of (16), we have revenues from taxing labor income equal to $\tau^n n^T = 0.029$, revenues from taxing housing of patient households given by $s\tau^h h = 0.069$, and housing subsidies for impatient households equal to $(1-s)\tau'^h h' = -0.098$. Once again, we see that the largest part, more than 70%, of housing subsidies are financed by taxing the housing of patient households. This can be interpreted as a redistribution from wealthy i.e., patient, households with higher housing stocks (*h = 6.5)* to poorer households with lower housing stocks (*h' = 5.1*).

To link these results to the empirical findings described in the introduction, we compute the ratio of total housing subsidies to GDP given by $\frac{-(1-s)\tau'^h h'}{swn+(1-s)wn'}$. For the baseline calibration, we get a ratio of 5.24%. As a result, according to the model, the subsidies granted in the US that added up to 1.5% of GDP in 2011 seem to have been lower than what would have been optimal. On the other hand, the model is likely to overestimate housing subsidies, since it does not incorporate physical capital. Housing is the only component of wealth in the model, while in the US it accounts for half of total household wealth (see e.g., Iacoviello (2009)).

Moreover, the resulting labor income tax of 19% for the baseline calibration is in the range of the effective average labor income tax estimates in the literature. For instance, Carey and Rabesona (2003) estimate an average ef-

fective labor income tax of 23% for the US between 1990 and 2000, while Mendoza et al. (1994) put it at 25% between 1965 and 1988.

Table 2. Numerical Results – Comparison

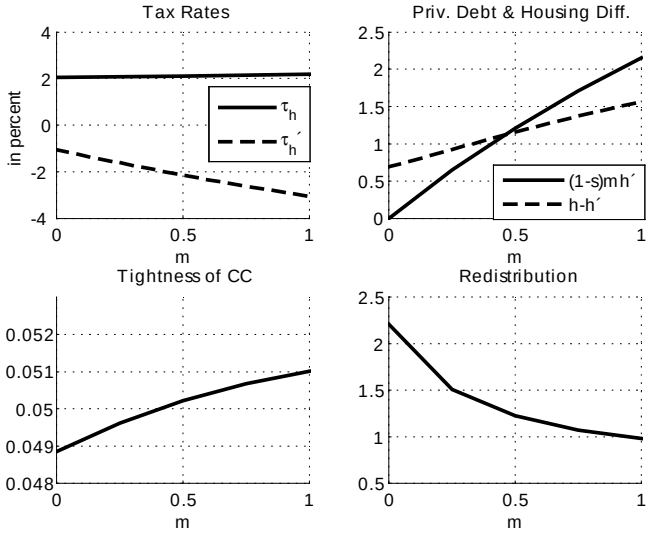
Version	Repr. Agent	Full Version	
Calibration	Baseline	Baseline	$g = b^g = 0$
c	0.8161	0.7999	0.9485
h	9.6310	6.5323	7.4249
n	1.0218	1.0630	1.0954
c'	-	0.8316	1.0136
h'	-	5.0929	6.6759
n'	-	0.9100	0.8398
τ^n	0.1795	0.1878	0.0296
τ^h	0.0020	0.0165	0.0149
τ'^h	-	-0.0272	-0.0388

Finally, our quantitative results can be linked to the recent work of Jacob and Ludwig (2012), who study how housing assistance programs affect labor supplied by the assisted households and provide empirical evidence of a negative effect. In line with their results, our model also predicts that the labor supply of impatient households declines with subsidies. The mechanism is as follows. The higher housing subsidies are, the lower the effective costs of housing for impatient households are; at the same time, the labor income tax is higher. Both lead to a reduction in labor supply, in line with the empirical evidence.

3.3 Discounting vs. Collateral Constraint

The result of subsidizing impatient agents' housing stems from two features of the model, as we have seen in the previous section: the different discount rates of the two types and the collateral constraint, with the former being necessary for the latter. Without different discount rates, the model collapses to become the representative-agent version, where private borrowing and, hence, the collateral constraint are irrelevant.

Figure 1. Effects of varying the pledgeable fraction of housing m for the baseline calibration with s=0.5.



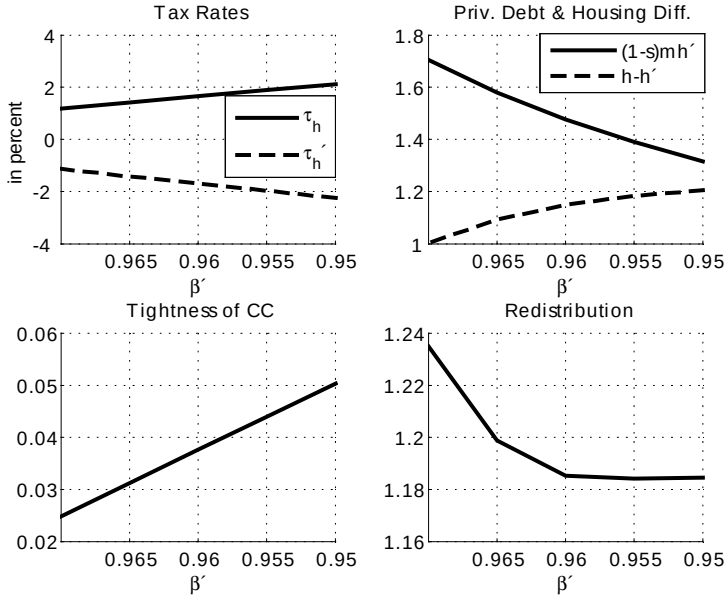
The aim of this section is to analyze how these two features affect housing subsidies. Therefore, we first define the two effects related to these two features. Housing subsidies stemming from the collateral constraint as described by the Ramsey model (in order to soften the constraint and thus can be said to originate from the market friction) are attributed to the *collateral effect*, whereas housing subsidies that purely arise from the difference in discounting (and are accordingly based on preferences) are attributed to the *discount-rate effect.* To identify how housing subsidies are influenced by these two effects, we conduct the following experiment. Let us consider a variation in the pledgeable fraction of housing, *m*, reaching from 0 to 1 and illustrate in Figure 1 how this affects the housing tax rates τ^h and τ'^h, private debt given by $(1-s)mh'$, the difference in housing stocks of the two agents, $h-h'$, the tightness of the collateral constraint measured by $\omega = c'^{-\mu^c}(\beta-\beta')$ (see (13)) , and redistribution as measured by the ratio of revenues from taxing housing of the patient agents to the subsidies that impatient agents receive, $red = -\frac{sh\tau^h}{(1-s)h'\tau'^h}$. The plots are given for the benchmark calibration but with equal shares, *s = 0.5*, for convenience in aggregation. Then we do the same for a variation in the borrowers' discount rate, between $\beta' = 0.95$ and $\beta' = 0.97$.

First, consider the lower limit $m = 0$, where private borrowing and hence the collateral effect are shut down (see Iacoviello (2005) for a similar experiment). Since the link between borrowing and housing of the impatient household is cut off, in this case the resulting level of subsidies is only due to the discount-rate effect. Then the variation in m between the lower and upper limit $m = 1$, where housing is fully pledgeable, illustrates the role of the collateral effect compared to the discount-rate effect for a given $\beta' = 0.95$. Figure 1 shows that a higher pledgeable fraction of housing leads to a larger amount of private debt (Panel 2) and later to a tighter collateral constraint (Panel 3), resulting in a higher level of housing subsidies for the constrained households (Panel 1, dashed line), whereas the tax rate on the patient agents does not change much (Panel 1, solid line). This is explained by the collateral constraint and with it the parameter m not being directly relevant for the patient agents. Thus, the level of redistribution (Panel 4), as measured here, decreases in m, since housing subsidies to impatient agents rise faster than housing tax revenues from patient ones do.

For $m = 0$, where the collateral channel is shut down, the resulting subsidy is $\tau'^{h} = -1.04\%$, whereas for the baseline case of $m = 0.55$, it more than doubles, to $\tau'^{h} = -2.24\%$. This makes clear that housing subsidies not only result from a difference in preference parameters but are also due to the market friction, the collateral constraint. Regarding the rates just mentioned and taking into account that the discount-rate channel dampens the effect of the collateral channel, which is discussed below, more than half of the resulting subsidies can be attributed to the collateral constraint in the baseline calibration.

Figure 2 plots the results for a variation in β'. Notice that β' decreases, i.e., the difference in discount rates increases from left to right on the abscissa. The higher this difference is, the larger the housing subsidy is for impatient agents τ'^{h} (Panel 1, dashed line) and the housing tax for patient agents τ^{h} (Panel 1, solid line). In contrast to the variation in m, the variation in β' affects both rates equally. As for a higher m, the level of redistribution (Panel 4) decreases in the difference in discount rates for the same reason. In contrast, unlike a higher m leading to higher borrowing, a larger discount-rate difference lowers borrowing, since it reduces the housing of the impatient agents. Hence, we can conclude that the discount-rate effect dampens the collateral effect in reducing private borrowing.

Figure 2. Effects of varying the impatient agents' discount rate β' for the baseline calibration with s=0.5.



3.4 Sensitivity Analyses

In the previous section, we have seen that the main result of optimality of housing subsidies to impatient agents is robust for variations in the parameters m and β'. In this section, we will check whether it is also robust for changes in the parameters μ^c, μ^h and s. Two interesting questions come to mind here. The first question is: what happens if the intertemporal elasticities are changed, i.e., if $\mu^h < \mu^c$? Since we have seen that this changed the sign of the housing tax in the representative-agent version, one wonders how this change in the parameters will affect optimal taxation in the full version. Another question we will explore is what happens when the share of lenders s is changed. We will consider the case where both types have equal shares $s = 0.5$. Table 3 summarizes the results.

Table 3. Numerical Results – Robustness

		Baseline Calibration with the exception of		
	-	$\mu^h = 1.5$	$\mu^c = 2$	$s = 0.5$
c	0.7999	0.7933	0.8713	0.7950
h	6.5323	9.2023	6.8915	5.9908
n	1.0630	1.0965	1.1581	1.0595
c'	0.8316	0.8396	0.8945	0.8198
h'	5.0929	6.8126	5.6412	4.7861
n'	0.9100	0.8739	0.9383	0.9370
τ^n	**0.1878**	**0.1882**	**0.2124**	**0.1935**
τ^h	0.0165	0.0150	0.0124	0.0212
τ'^h	**-0.0272**	**-0.0281**	**-0.0366**	**-0.0224**

First of all, we can conclude from Table 3 that for every parameter variation we consider, it remains optimal to subsidize the housing of impatient households and to tax the housing of patient ones.

In the third column, where we lower μ^h, housing demand rises, and both types have higher housing stocks ($\frac{h^T}{y} \approx 8.2$) compared to the baseline calibration in Column 2 of Table 3. Although τ^h is lower, tax revenues from taxing the housing of patient agents are higher due to their higher housing stock $h = 9.2$. Therefore, subsidies for impatient households can increase slightly.

In Column 4, we set $\mu^c = 2 > \mu^h = 1.75$, and we see that, in contrast to the representative-agent version, there is no important change in the tax rates. Moreover, τ'^h becomes larger while τ^h decreases, since households attach a higher value to housing compared to consumption. As a result, both types work more to own a larger house, while the labor income tax rises to finance the subsidies.

In Column 5, the share of lenders in the economy is lower than in the baseline calibration. This means that there are fewer wealth-rich households in the economy bearing the tax burden. Therefore, the tax rates τ^n and τ^h are higher, while the subsidy τ'^h is lower. As a result, both types of households have lower consumption and housing levels.

In summary, in every variation we considered, m, β', μ^h and s, the main principle of this paper holds: it is optimal to disburden the impatient and constrained households by subsidizing their housing.

4. Conclusion

Housing subsidies, which are common in many industrialized countries, have been subject to macroeconomic studies for many years. Nevertheless, no definite conclusion has yet been drawn from all this research. While its opponents highlight the inefficiencies associated with the practice caused by the resulting distortions in investment decisions of agents, its proponents argue that subsidies internalize the externalities brought by homeownership.

This paper, in which we have reported on our study of optimal taxation of housing in a borrower-lender framework with different discount rates and where housing is used as collateral for private loans, provides results in favor of housing subsidies. The main finding of this paper is that in such an economy, optimal fiscal policy should disburden impatient borrowers by subsidizing their housing in the presence of collateral constraints. This subsidy has to be financed to the largest extent possible by a housing tax on the patient and unconstrained households and to a smaller extent by a labor income tax. That being the case, redistribution from patient/unconstrained households to impatient/constrained ones would take place.

In this framework, housing subsidies result from two features of the model, the different discount rates of the two types of agents and the collateral constraint. We have seen that, for the baseline calibration, more than half of the subsidy can be attributed to the collateral constraint. Consequently, housing subsidies not only result from the difference in preference parameters but are also from the market friction in our model. Moreover, the sensitivity analyses show that the main result of housing subsidies for constrained households is robust for several parameter variations.

In addition, we considered a representative-agent version of the model, the results of which bore out our intuition and were in line with the principles of optimal taxation. For the baseline calibration, however, it was not optimal to subsidize housing.

This paper gives a rationale for governments to continue providing housing subsidies that goes beyond the externalities that others have focused on in the literature. As such, it indicates a new path for further research. One extension of the model could be the addition of inter-generational heterogeneity in an overlapping-generations model, as in Gervais (2002). The life-cycle be-

havior of agents could also have substantial implications and should also be accounted for when trying to measure the effects of housing subsidies on social welfare.

A. Appendix

In this Appendix, only the derivation of the solution of the full version is given. To economize on space, we do not present the analytical solution of the representative-agent version of the model here and refer the interested reader to Polattimur (2013), where this is done.

A.1 Aggregate Resource Constraint

Consolidation of the budget constraints (4), (5) and (6) delivers

$$\begin{aligned} & sc_t + (1-s)c_t^{'} + sp_{h,t}\left[\left(1+\tau_t^h\right)h_t - (1-\delta_h)h_{t-1}\right] \\ & +(1-s)\,p_{h,t}\left[\left(1+\tau_t^{'h}\right)h_t^{'} - (1-\delta_h)h_{t-1}^{'}\right] + g_t \\ & = s\left(1-\tau_t^n\right)w_t n_t + (1-s)\left(1-\tau_t^n\right)w_t n_t^{'} \\ & +s\tau_t^h p_{h,t}h_t + (1-s)\tau_t^{'h} p_{h,t}h_t^{'}, \end{aligned}$$

since the terms b_t, $b_t^{'}$ and b_t^g cancel out. With $x_t^T = sx_t + (1-s)x_t^{'}$ for aggregate variables this becomes

$$\begin{aligned} & c_t^T + p_{h,t}\left[\left(1+\tau_t^h\right)h_t^T - (1-\delta_h)h_{t-1}^T\right] + g_t \\ & = \left(1-\tau_t^n\right)w_t n_t^T + \tau_t^h p_{h,t}h_t^T, \end{aligned}$$

which can further be simplified to

$$\begin{aligned} & c_t^T + p_{h,t}h_t^T + g_t \\ & = w_t n_t^T + p_{h,t}(1-\delta_h)h_{t-1}^T. \end{aligned}$$

Inserting the production functions, we get (14).

A.2 Solution of the Full Version

A.2.1 The Ramsey Problem

The Ramsey problem reads

$$J=\sum_{t=0}^{\infty}\left\{\begin{array}{c}\beta^{t}su(c_{t},h_{t},n_{t})+\beta'^{t}(1-s)u(c_{t}',h_{t}',n_{t}')\\+\left(\beta^{A}\right)^{t}\lambda_{t,1}\left[h_{t}^{-\mu^{h}}-\left(1+\tau_{t}^{h}\right)c_{t}^{-\mu^{c}}+\beta(1-\delta_{h})c_{t+1}^{-\mu^{c}}\right]\\+\left(\beta^{A}\right)^{t}\lambda_{t,2}\left[n_{t}^{\mu^{n}}c_{t}^{\mu^{c}}-1+\tau_{t}^{n}\right]+\left(\beta^{A}\right)^{t}\lambda_{t,3}\left[n_{t}'^{\mu^{n}}c_{t}'^{\mu^{c}}-1+\tau_{t}^{n}\right]\\+\left(\beta^{A}\right)^{t}\lambda_{t,4}\left[\begin{array}{c}h_{t}'^{-\mu^{h}}-\left(1+\tau_{t}'^{h}\right)c_{t}'^{-\mu^{c}}+\beta'(1-\delta_{h})c_{t+1}'^{-\mu^{c}}\\-m\left(c_{t}'^{-\mu^{c}}c_{t}^{\mu^{c}}\beta c_{t+1}^{-\mu^{c}}-\beta'c_{t+1}'^{-\mu^{c}}\right)\end{array}\right]\\+\left(\beta^{A}\right)^{t}\lambda_{t,5}\left[\begin{array}{c}-c_{t}'-\left(1+\tau_{t}'^{h}\right)h_{t}'+\left(1-\tau_{t}^{n}\right)n_{t}'+(1-\delta_{h})h_{t-1}'\\+\frac{mh_{t}'}{c_{t}^{-\mu^{c}}}\beta c_{t+1}^{-\mu^{c}}-mh_{t-1}'\end{array}\right]\\+\left(\beta^{A}\right)^{t}\lambda_{t,6}\left[\begin{array}{c}-sc_{t}-(1-s)c_{t}'-g_{t}-sh_{t}-(1-s)h_{t}'\\+sn_{t}+(1-s)n_{t}'+(1-\delta_{h})\left(sh_{t-1}+(1-s)h_{t-1}'\right)\end{array}\right]\\+\beta^{t}\lambda_{7}\frac{c_{t}^{-\mu^{c}}}{c_{0}^{-\mu^{c}}}\left[g_{t}-s\tau_{t}^{h}h_{t}-(1-s)\tau_{t}'^{h}h_{t}'-\tau_{t}^{n}\left(sn_{t}+(1-s)n_{t}'\right)\right]+\beta^{t}\lambda_{7}b_{0}^{g}\end{array}\right\}$$

where $\lambda_{t,i}$ denotes the Langrange multiplier on constraint i in period t, while the multiplier λ_{7} on the implementability constraint, which is derived in Appendix A.2.2, has no time index, since it is an intertemporal constraint. The first-order conditions of the Ramsey problem are derived in Appendix A.2.3, where the steady state of the problem is also given.

A.2.2 Intertemporal government budget constraint

The intertemporal government budget constraint is derived as follows. We write the government budget (6) for $t+1$ and solve for

$$b_{t+1}^{g}=s\tau_{t+1}^{h}p_{h,t+1}h_{t+1}+(1-s)\tau_{t+1}'^{h}p_{h,t+1}h_{t+1}'+\tau_{t+1}^{n}w_{t+1}n_{t+1}^{T}-g_{t+1}+\frac{b_{t+2}^{g}}{R_{t+1}^{g}}$$

and insert this in the one for t

$$g_{t}-\frac{1}{R_{t}^{g}}\left[s\tau_{t+1}^{h}p_{h,t+1}h_{t+1}+(1-s)\tau_{t+1}'^{h}p_{h,t+1}h_{t+1}'+\tau_{t+1}^{n}w_{t+1}n_{t+1}^{T}-g_{t+1}+\frac{b_{t+2}^{g}}{R_{t+1}^{g}}\right]+b_{t}^{g}$$
$$=s\tau_{t}^{h}p_{h,t}h_{t}+(1-s)\tau_{t}'^{h}p_{h,t}h_{t}'+\tau_{t}^{n}w_{t}n_{t}^{T}.$$

This can be rewritten as

$$g_t + \frac{g_{t+1}}{R_t^g} - \frac{b_{t+2}^g}{R_t^g R_{t+1}^g} + b_t^g = s\tau_t^h p_{h,t} h_t + (1-s)\tau_t^{'h} p_{h,t} h_t^{'}$$
$$+ \frac{s\tau_{t+1}^h p_{h,t+1} h_{t+1} + (1-s)\tau_{t+1}^{'h} p_{h,t+1} h_{t+1}^{'}}{R_t^g} + \tau_t^n w_t n_t^T + \frac{\tau_{t+1}^n w_{t+1} n_{t+1}^T}{R_t^g}.$$

Incorporating the transversality condition on government debt yields the intertemporal government budget constraint:

$$\sum_{t=0}^{\infty}\left(\prod_{i=0}^{t-1}\left(R_i^g\right)^{-1}\right) g_t + b_0^g$$
$$= \sum_{t=0}^{\infty}\left(\prod_{i=0}^{t-1}\left(R_i^g\right)^{-1}\right) s\tau_t^h p_{h,t} h_t + (1-s)\tau_t^{'h} p_{h,t} h_t^{'} + \sum_{t=0}^{\infty}\left(\prod_{i=0}^{t-1}\left(R_i^g\right)^{-1}\right)\tau_t^n w_t n_t^T$$
$$\Leftrightarrow \sum_{t=0}^{\infty}\left(\prod_{i=0}^{t-1}\left(R_i^g\right)^{-1}\right)\left[g_t - s\tau_t^h p_{h,t} h_t - (1-s)\tau_t^{'h} p_{h,t} h_t^{'} - \tau_t^n w_t n_t^T\right] + b_0^g = 0.$$

A.2.3 First-Order conditions and steady state

The first-order conditions of the Ramsey problem can be summarized by

$$\lambda_{t,1} c_t^{-\mu^c} + \overline{\beta}^t \lambda_7 \frac{c_t^{-\mu^c}}{c_0^{-\mu^c}} s h_t = 0$$

$$\lambda_{t,2} + \lambda_{t,3} - \lambda_{t,5} n_t^{'} - \overline{\beta}^t \lambda_7 \frac{c_t^{-\mu^c}}{c_0^{-\mu^c}} n_t^T = 0$$

$$\lambda_{t,4} c_t^{'-\mu^c} + \lambda_{t,5} h_t^{'} + \overline{\beta}^t \lambda_7 \frac{c_t^{-\mu^c}}{c_0^{-\mu^c}} (1-s) h_t^{'} = 0$$

for the tax rates

$$\overline{\beta}^{t}\frac{sc_t}{\mu^c}+\lambda_{t,1}\left(1+\tau_t^h\right)+\lambda_{t,2}n_t^{\mu^n}c_t^{2\mu^c}-\lambda_{t,4}mc_t^{'-\mu^c}\beta c_{t+1}^{-\mu^c}c_t^{2\mu^c}$$

$$+\lambda_{t,5}mh_t^{'}\beta c_{t+1}^{-\mu^c}c_t^{2\mu^c}-\lambda_{t,6}\frac{sc_t^{\mu^c+1}}{\mu^c}-\overline{\beta}^{t}\frac{\lambda_7}{c_0^{-\mu^c}}\left[g_t-s\tau_t^h h_t-(1-s)\tau_t^{'h}h_t^{'}-\tau_t^n n_t^T\right]$$

$$-\overline{\beta}\lambda_{t-1,1}(1-\delta_h)+\overline{\beta}\lambda_{t-1,4}mc_{t-1}^{'-\mu^c}c_{t-1}^{\mu^c}-\overline{\beta}\lambda_{t-1,5}mh_{t-1}^{'}c_{t-1}^{\mu^c}=0$$

$$\overline{\beta}^{t}h_t^{-\mu^h}-\lambda_{t,1}\frac{\mu^h}{s}h_t^{-\mu^h-1}-\lambda_{t,6}-\overline{\beta}^{t}\lambda_7\frac{c_t^{-\mu^c}}{c_0^{-\mu^c}}\tau_t^h+\lambda_{t+1,6}\beta^A(1-\delta_h)=0$$

$$-\overline{\beta}^{t}n_t^{\mu^n}+\lambda_{t,2}\frac{\mu^n}{s}c_t^{\mu^c}n_t^{\mu^n-1}+\lambda_{t,6}-\overline{\beta}^{t}\lambda_7\frac{c_t^{-\mu^c}}{c_0^{-\mu^c}}\tau_t^n=0$$

for the patient agents, and

$$\underline{\beta}^{t}\frac{(1-s)c_t^{'}}{\mu^c}+\lambda_{t,3}n_t^{'\mu^n}c_t^{'2\mu^c}+\lambda_{t,4}\left[\left(1+\tau_t^{'h}\right)+mc_t^{\mu^c}\beta c_{t+1}^{-\mu^c}\right]-\frac{\lambda_{t,5}}{\mu^c c_t^{'-\mu^c-1}}$$

$$-\frac{\lambda_{t,6}(1-s)}{\mu^c c_t^{'-\mu^c-1}}-\underline{\beta}\lambda_{t-1,4}\left[1-\delta_h+m\right]=0$$

$$\underline{\beta}^{t}h_t^{'-\mu^h}-\lambda_{t,4}\frac{\mu^h}{(1-s)}h_t^{'-\mu^h-1}-\frac{\lambda_{t,5}}{(1-s)}\left[\left(1+\tau_t^{'h}\right)-mc_t^{\mu^c}\beta c_{t+1}^{-\mu^c}\right]-\lambda_{t,6}$$

$$-\overline{\beta}^{t}\lambda_7\frac{c_t^{-\mu^c}}{c_0^{-\mu^c}}\tau_t^{'h}+\beta^A\lambda_{t+1,5}\frac{(1-\delta_h-m)}{(1-s)}+\beta^A\lambda_{t+1,6}(1-\delta_h)=0$$

$$-\underline{\beta}^{t}n_t^{'\mu^n}+\lambda_{t,3}\frac{\mu^n}{(1-s)}c_t^{'\mu^c}n_t^{'\mu^n-1}+\lambda_{t,5}\frac{\left(1-\tau_t^n\right)}{(1-s)}+\lambda_{t,6}-\overline{\beta}^{t}\lambda_7\frac{c_t^{-\mu^c}}{c_0^{-\mu^c}}\tau_t^n=0,$$

for the impatient agents, with $\overline{\beta}^{t}=\frac{\beta^t}{\beta^{At}}=\left(\frac{\beta}{\beta^s\beta^{'(1-s)}}\right)^t=\left[\left(\frac{\beta}{\beta'}\right)^{1-s}\right]^t$ and $\underline{\beta}^{t}=\frac{\beta^{'t}}{\beta^{At}}=\left(\frac{\beta'}{\beta^s\beta^{'(1-s)}}\right)^t=\left[\left(\frac{\beta'}{\beta}\right)^{s}\right]^t$.

Assuming that we are initially in the steady state ($c_0 = c$ for $t = 0$), where variables without subscript henceforth denote steady-state values, we read these conditions as being in the steady state.

$$\lambda_1 c^{-\mu^c} + \lambda_7 sh = 0$$

$$\lambda_2 + \lambda_3 - \lambda_5 n' - \lambda_7 n^T = 0$$

$$\lambda_4 c^{'-\mu^c} + \lambda_5 h' + \lambda_7 (1-s) h' = 0$$

$$\frac{sc}{\mu^c} + \lambda_1 \left[1 + \tau^h - \overline{\beta}(1-\delta_h)\right] + \lambda_2 (1-\tau^n) c^{\mu^c}$$

$$+ \lambda_4 m c^{'-\mu^c} c^{\mu^c} \left(\overline{\beta} - \beta\right) + \lambda_5 m h' c^{\mu^c} \left(\beta - \overline{\beta}\right) - \lambda_6 \frac{s c^{\mu^c + 1}}{\mu^c}$$

$$- \lambda_7 c^{\mu^c} \left[g - s\tau^h h - (1-s)\tau^{'h} h' - \tau^n n^T\right] = 0$$

$$h^{-\mu^h} \left(1 - \lambda_1 \frac{\mu^h}{sh}\right) + \lambda_6 \left[\beta^A (1-\delta_h) - 1\right] - \lambda_7 \tau^h = 0$$

$$- n^{\mu^n} + \lambda_2 \frac{\mu^n (1-\tau^n)}{sn} + \lambda_6 - \lambda_7 \tau^n = 0$$

$$\frac{(1-s)c'}{\mu^c} + \lambda_3 (1-\tau^n) c^{'\mu^c} + \lambda_4 \left[1 + \tau^{'h} + m\beta - \underline{\beta}(1 - \delta_h + m)\right]$$

$$- \frac{\lambda_5}{\mu^c c^{'-\mu^c - 1}} - \frac{\lambda_6 (1-s)}{\mu^c c^{'-\mu^c - 1}} = 0$$

$$h^{'-\mu^h} \left(1 - \lambda_4 \frac{\mu^h}{(1-s)h'}\right) + \lambda_5 \left[\frac{\beta^A (1 - \delta_h - m) - 1 - \tau^{'h} + m\beta}{1-s}\right]$$

$$+ \lambda_6 \left[\beta^A (1-\delta_h) - 1\right] - \lambda_7 \tau^{'h} = 0$$

$$- n^{'\mu^n} + \lambda_3 \frac{\mu^n (1-\tau^n)}{(1-s)n'} + \lambda_5 \frac{(1-\tau^n)}{(1-s)} + \lambda_6 - \lambda_7 \tau^n = 0.$$

The private-sector equilibrium conditions, which determine the steady state together with the first-order conditions of the Ramsey problem, are given by

$$
\begin{aligned}
h^{-\mu^h} &= c^{-\mu^c}\left[\left(1+\tau^h\right)-\beta\left(1-\delta_h\right)\right] \\
n^{\mu^n} c^{\mu^c} &= \left(1-\tau^n\right) \\
R^g &= R=\frac{1}{\beta} \\
h'^{-\mu^h} &= c'^{-\mu^c}\left[\left(1+\tau'^h\right)-\beta'\left(1-\delta_h\right)+m\left(\beta-\beta'\right)\right] \\
n'^{\mu^n} c'^{\mu^c} &= \left(1-\tau^n\right) \\
c' &= n'\left(1-\tau^n\right)+h'\left[m\left(\beta-1\right)-\delta_h-\tau'^h\right] \\
g+\left(1-\beta\right)b^g &= s\tau^h h+\left(1-s\right)\tau'^h h'+\tau^n\left(sn+\left(1-s\right)n'\right) \\
sc+\left(1-s\right)c'+g &= sn+\left(1-s\right)n'-\delta_h sh-\delta_h\left(1-s\right)h'.
\end{aligned}
$$

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Size and Progression of the Shadow Economies of Turkey and Other OECD Countries from 2003 to 2013: Some New Facts

Friedrich Schneider[*]

Abstract

In this paper, the main focus is on the definition, measurement methods, and causal factors of the shadow economy in OECD countries. The greatest influence on the shadow economy is tax policies and state regulation. Furthermore, an appreciation of the overall burden of the state (taxes and regulations) and the general situation in the labor market, including levels of self-employment and unemployment, is crucial for an understanding of the dynamics of the shadow economy.

JEL Codes: K42, H26, D78.

Keywords: Shadow economy, undeclared work, tax morale, tax pressure, state regulation.

[*] Prof. Dr., Department of Economics, Johannes Kepler University, Altenbergerst. 69, A-4040 Linz, Austria, Phone: +43 (0) 732 2468-8210, Fax: +43 (0) 732 2468-8209.
Email: friedrich.schneider@jku.at, http://www.econ.jku.at/schneider

1. Introduction

Fighting tax evasion and the shadow economy has been an important policy goal in OECD countries for decades. In order to realize this goal, governments first need to know much more about the phenomenon of the shadow economy: its size and extent, how it developed, and why people are motivated to participate in it. Hence, in this paper, I am mainly concerned with presenting the definition, measurement, driving forces, and the size and progression over time of the shadow economies of Turkey and other OECD countries. Tax evasion as such is not explored in depth here so as to keep the subject of this paper tractable and preclude the addition of too many other aspects.[1] In any case, tax morale or experimental studies of tax compliance are beyond the scope of this paper.[2]

My paper is organized as follows: Section 2 presents theoretical considerations of the definition (2.1) and measurement of the shadow economy (2.2) and discusses the main factors (2.3) determining its size. In Section 3, certain empirical results of the size and progression of the shadow economies of Turkey and other OECD countries are covered. In Section 4, the driving forces of the shadow economy are outlined. Finally, in Section 5, several policy conclusions are drawn.

2. Some Theoretical Considerations of the Shadow Economy

2.1 Defining the Shadow Economy

Most authors trying to measure the shadow economy still face the difficulty of a precise definition of it.[3] According to one commonly used defini-

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1 See Andreoni, Erard, and Feinstein (1998) for the authoritative survey, Feld and Frey (2007) or Kirchler (2007) for broader interdisciplinary approaches, or the papers by Kirchler, Maciejovsky, and Schneider (2003), Kastlunger, Kirchler, Mittore, and Pitters (2009), and Kirchler, Hoelzl, and Wahl (2007).

2 The authoritative scientific work on tax morale is by Torgler (2007). See also Torgler (2002) for a survey of experimental studies.

3 My paper focuses on the size and progression of the shadow economy for uniform countries and not for specific regions. Recently, first studies have been undertaken to measure the size of the shadow economy as well as the "gray" or "shadow" labor force for urban regions or states (e.g., California). See, e.g., Marcelli, Pastor, and Joassart (1999), Marcelli (2004), Chen (2004), Williams and Windebank (1998, 2001a, b), Flaming, Hayolamak, and Jossart (2005), Alderslade, Talmage, and Freeman (2006), and Brück, Haisten-DeNew, and Zimmermann (2006). Herwartz, Schneider, and Tafenau (2009) and Tafenau, Herwartz, and Schneider (2010) estimate the size of the shadow economy of 234 EU-NUTS regions for the year 2004 for the first time, demonstrating a considerable regional variation in its size. Lately, Buehn (2012) has estimated the size and changes over time of various German districts.

tion, it comprises all currently unregistered economic activities that contribute to the officially calculated Gross National Product.[4] Smith (1994, p. 18) defines it as "market-based production of goods and services, whether legal or illegal, that escapes detection in the official estimates of GDP." Put differently, one of the broadest definitions is: "…those economic activities and the income derived from them that circumvent or otherwise avoid government regulation, taxation, or observation."[5] As these definitions still leave room for interpretation, Table 2.1 provides a further clarification as to what could be a reasonable consensus definition of the underground (or shadow) economy.

Table 2.1 A Taxonomy of Types of Underground Economic Activities[1)]

Type of Activity	Monetary Transactions		Non-Monetary Transactions	
ILLEGAL ACTIVITIES	Trade in stolen goods; drug dealing and manufacturing; prostitution; gambling; smuggling; fraud, human-, drug-, and weapons-trafficking		Barter of drugs, stolen goods, smuggling, etc. Production of or growing drugs for own use; theft of goods for own use.	
	Tax Evasion	Tax Avoidance	Tax Evasion	Tax Avoidance
LEGAL ACTIVITIES	Unreported income from self-employment; wages, salaries, and assets from unreported work related to legal services and goods	Employee discounts, fringe benefits	Barter of legal services and goods	All do-it-yourself work and neighborly help

[1)] Structure of the table is taken from Lippert and Walker (1997, p. 5), with additional remarks.

From Table 2.1, it is obvious that a broad definition of the shadow economy includes unreported income from the production of legal goods and services, either from monetary or barter transactions–and therefore covers all productive economic activities that would generally be taxable were they reported to the state (tax) authorities.

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[4] This definition is used, e.g., by Feige (1989, 1994), Schneider (1994a, 2003, 2005, 2011) and Frey and Pommerehne (1984). Do-it-yourself activities are not included. For estimates of the shadow economy and the do-it-yourself activities for Germany, see Bühn, Karmann, and Schneider (2009) or Karmann (1986, 1990).

[5] This definition is taken from Del'Anno (2003), Del'Anno and Schneider (2004), and Feige (1989); see also Thomas (1999), Fleming, Roman, and Farrell (2000), or Feld and Larsen (2005, p. 25).

In this paper, the following more narrow definition of the shadow economy is used:[6] the shadow economy refers to all market-based legal production of goods and services that are deliberately concealed from public authorities for the following reasons:

1. to avoid payment of income, value added, or other taxes,
2. to avoid payment of social-security contributions,
3. to avoid having to meet certain legal labor-market standards, such as minimum wages, maximum working hours, safety standards, etc., and
4. to avoid complying with certain administrative obligations, such as completing statistical questionnaires or other administrative forms.

Thus, I will not deal with typically illegal underground economic activities that fit the characteristics of classic crimes, like burglary, robbery, drug dealing, etc. I also exclude the informal household economy, which consists of all household services and production.

2.2 Measuring the Shadow Economy[7]

The definition of the shadow economy plays a leading role in assessing its size. With a clear definition, a number of ambiguities and controversies can be avoided. In general, there are two types of shadow economic activities: illicit employment and household-produced goods and services, which are mostly consumed within the household. The following analysis tries to exclude illegal activities, such as drug production, robbery, and human trafficking. Likewise, household-produced goods and services, e.g., schooling and child care, are not part of this analysis. Thus, the focus is limited to productive economic activities that would normally appear in the national accounts but that remain underground due to tax or regulatory burdens.[8] Although such legal activities contribute to the country's value added, they are not captured in the national accounts because they occur in illicit ways (e.g., services provided by those without proper qualifications or a craftsman's certification). From the economic and social perspective, soft forms of illicit employment, such as moonlighting (e.g., construction work in private homes) and its contribution to aggregate value-added, can be assessed rather positively.

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[6] See also the excellent discussion of the definition of the shadow economy in Pedersen (2003, pp.13-19) and Kazemier (2005a), who use a similar one.

[7] Compare also Feld and Schneider (2010) and Schneider (2011).

[8] With this definition, the problem of having classic crimes included is avoided because neither the MIMIC procedure nor the currency-demand approach captures these activities: e.g., drug dealing is independent of increasing taxes, especially as the included causal variables are not linked (or causal) to classic criminal activities. See, e.g., Thomas (1992), Kazemir (2005a, b), and Schneider (2005).

Although the issue of the shadow economy has long been under investigation, the discussion of what is the "appropriate" methodology for assessing its scope has been contentious—to the present day.[9] There are three methods of assessment:

(1) Direct procedures at a micro level that aim to determine the size of the shadow economy at one particular point in time. An example is the survey method;

(2) Indirect procedures that make use of macro-economic indicators as a proxy for the behavior of the shadow economy over time;

(3) Statistical models that estimate the shadow economy as an "unobserved" variable.

Today in most cases, the estimation of the shadow economy is based on a combination of the MIMIC (Multiple Indicators and Multiple Courses) procedure and the currency-demand method; or on just the currency-demand method.[10] The MIMIC procedure assumes that the shadow economy remains an unobserved phenomenon (latent variable) that can be visualized by means of quantitatively measurable causes of illicit employment, e.g., tax burden and regulation intensity, and indicators reflecting illicit activities, e.g., currency demand, official GDP, and official working time. A disadvantage of the MIMIC procedure is the fact that it produces only relative estimates of the size of the shadow economy. Thus, the currency-demand method[11] is resorted to in order to calibrate the relative-into-absolute estimates (e.g., in percent of GDP); this is done by working with two or three absolute values (in percent of GDP) to yield the size of the shadow economy.

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[9] For the strengths and weaknesses of the various methods, see Bhattacharyya (1999), Breusch (2005a, b), Dell'Anno, and Schneider (2009), Dixon (1999), Feige (1989), Feld and Larsen (2005), Feld and Schneider (2010), Giles (1999a, b, c), Schneider (1986, 2001, 2003, 2005, 2006, 2011), Schneider and Enste (2000a, b, 2002, 2006, 2013), Tanzi (1999), and Thomas (1992, 1999).

[10] These methods are presented in detail in Schneider (1994a, b, c, 2005, 2011), Feld and Schneider (2010), and Schneider and Enste (2000b, 2002, 2006, 2013). Furthermore, these studies discuss advantages and disadvantages of the MIMIC and the money-demand methods as well as other estimation methods for assessing the size of illicit employment; for a detailed discussion, see Feld and Larsen (2005).

[11] This indirect approach is based on the assumption that cash is used to make transactions within the shadow economy. By using this method, one econometrically estimates a currency-demand function, including independent variables like tax burden, regulation, etc. that "drive" the shadow economy. This equation is used to make simulations of the amount of money that would be necessary to generate the official GDP. This amount is then compared with the actual money demand, and the difference is treated as an indicator for the development of the shadow economy. On this basis, the calculated difference is multiplied by the velocity of money of the official economy, producing a value-added figure for the shadow economy. See footnote 9 for references that critique this method.

Another way of guessing the size of the shadow economy is through survey methods (Feld and Larsen (2005, 2008, 2009)). To minimize the number of defective respondents (i.e., those who give dishonest responses or decline to answer the more sensitive questions), structured interviews are undertaken (usually face-to-face) in which the respondents are slowly exposed to the main purpose of the survey. As with the contingent-valuation method (CVM) in environmental economics (Kopp et al., 1997), the questionnaire first aims at shaping respondents' perception of the issue at hand, then elicits reports of their activities in the shadow economy, followed by a group of the usual socio-demographic questions.

In addition to the studies by Merz and Wolff (1993), Feld and Larsen (2005, 2008, 2009), Haigner et al. (2011), and Enste and Schneider (2006) for Germany, the survey method has been applied in the Nordic countries, Great Britain (Isachsen and Strøm 1985, Pedersen 2003), and the Netherlands (van Eck and Kazemier 1988, Kazemier 2006). While the questionnaires underlying these studies are broadly comparable in design, recent attempts by the European Union to provide survey results for all EU member states have run into difficulties as far as comparability is concerned (Renooy et al. 2004, European Commission 2007); part of the problem arises from the wording of the questionnaires, which becomes more and more cumbersome in certain of the national cultures when the subject is the underground economy.

These two sets of approaches are the ones most broadly seen in the literature. Although each has its drawbacks, and although biases in estimates of the shadow economy almost certainly exist, no better data are currently available. Moreover, let me clearly state that there is no exact measure for the size of the shadow economy. Each method has its strengths and weaknesses (shown in detail in Schneider and Enste (2000b)). Every such estimate carries an error margin of +/- 15%, with the macro estimates (e.g., MIMIC, currency-demand method, the electricity approach) being upper-bound estimates and the micro (survey) estimates lower-bound.

In tax-compliance research, the most interesting data stem from actual tax audits by the US Internal Revenue Service (IRS). In the Taxpayer Compliance Measurement Program (TCMP), the degree of actual compliance of taxpayers is observed and finds its way into empirical analysis (Andreoni, Erard, and Feinstein 1998). Whereas the approach of the IRS is more encompassing, given that its target is tax evasion from all sources of income, the two methods mentioned above concentrate on labor income and the attempts to evade tax on it generate a sharper picture of the shadow economy. Even the data obtained from the TCMP is biased, however, because the actually detected cases of tax non-compliance could only be the tip of the iceberg. Even so, the

imperfect data in this area can still offer interesting insights into the size, the structure, and the determinants of the shadow economy and its labor force.

2.3 The Main Causes of the Shadow Economy

A useful starting point for a theoretical discussion of tax non-compliance is the paper by Allingham and Sandmo (1972) on income-tax evasion. While the shadow economy and tax evasion are not congruent, activities in the shadow economy in most cases imply the evasion of direct or indirect taxes. This being the case, the factors driving tax evasion will most certainly also affect the shadow economy. According to Allingham and Sandmo, tax compliance depends on its expected costs and benefits. More specifically, the benefits of tax non-compliance result from the individual marginal tax rate and the true individual income. In the case of the shadow economy, we derive the individual marginal tax rate by calculating the overall marginal tax burden from indirect and direct taxes, including social-security contributions. The individual income generated in the shadow economy is usually categorized as labor income, less often as capital income. As for the costs of non-compliance, these arise from deterrence enacted by the state. In practice, this has meant that tax non-compliance is more a function of the zealousness of a state auditing authority and the resulting corresponding likelihood of being caught, as well as the fines that would have to be paid. As individual morality also plays a role in compliance, additional downsides could come in the form of psychic costs like shame or regret, but also unforeseen additional pecuniary costs if, for instance, damage to one's reputation results.

Kanniainen, Pääkönen, and Schneider (2004) incorporate many of these insights into their model of the shadow economy in their view of labor-supply decisions. They hypothesize that tax hikes unambiguously increase the shadow economy, while the effect of the public goods financed by those taxes depends on the ability of members of the society to access them. Morality is also part of this analysis. But the moral-related costs for individual non-compliers appear to be mainly offset by state punishment, although self-esteem also figures in the dynamic at work here.

One shortcoming of these analyses is the neglected endogenicity of tax morale and good governance. In contrast, Feld and Frey (2007) argue that tax compliance is the result of a complicated interaction between tax morale and deterrence measures. While it is a given that taxpayers must know what the rules of the game are and as the state's deterrence measures serve as signals for the tax morale that a society wants to elicit (Posner 2000a, b), nonetheless such deterrence could also diminish the intrinsic motivation to pay taxes. Moreover, tax morale is not only boosted when taxpayers perceive the public

goods they receive in exchange for their tax payments to be worth it. It also grows if political decisions affecting the public are seen as fairly followed out and if the tax authorities are regarded as friendly and fair when dealing with the public. Tax morale is thus not exogenously given but is influenced by deterrence, the quality of government institutions, and the constitutional differences among countries.

Although this leaves me with a rich set of variables that might influence the size of the shadow economy, it is only the starting point. Since labor-supply decisions are involved, labor- and product-market regulations must also be accounted for. Recent theoretical approaches thus suggest following a differentiated policy to contain the shadow economy's expansion.

2.3.1 Deterrence[12]

There is surprisingly little known from empirical studies about the effects of tax non-compliance deterrence. In their survey of tax compliance, Andreoni, Erard, and Feinstein (1998) report that deterrence affects the incidence of tax evasion but that the reported effects are rather small. Blackwell (2010) finds strong deterrence effects of fines and audits in experimental tax evasion. Regarding the shadow economy, however, there is little evidence.

This is due to the unavailability of data on the legal background and the frequency of audits on an international basis. They would also be difficult to collect even for the OECD member countries. A study by Feld, Schmidt, and Schneider (2007) demonstrates this in Germany, where there was an especially knotty legal background, with differentiating fines and other punishments meted out according to the severity of the offense, the true income of the non-complier, and the geographical location of the target (directives from courts on such punishments varied from German state to German state). Moreover, the tax authorities at the state level would not reveal how intensively auditing was taking place. Therefore, the authors worked with the available data on fines and audits and conducted a time-series analysis with the estimates of the shadow economy obtained by the MIMIC approach. According to their results, deterrence does not have a consistent effect on the German shadow economy. The Granger causality tests showed the direction of causation (in the sense of precedence) was ambiguous, leaving room for either an interpretation having the shadow economy impacting deterrence activities or vice versa.

Feld and Larsen (2005, 2008, 2009) follow a different approach with their individual survey data for Germany. First replicating Pedersen (2003), who

[12] This part is taken from Feld and Schneider (2010, pp. 115-116).

reports a negative impact of the subjectively perceived risk of detection by state audits on the probability of working in the shadows for the year 2001, they then extend it by adding subjectively perceived measures of fines and other punishments. Fines and punishments turn out not to exert a negative influence on the shadow economy in any of the annual waves of surveys, nor in the pooled regressions for the 2004-07 period (about 8,000 observations overall). The subjectively perceived risk of detection has a robust and significant negative impact in individual years only for women. In the pooled sample for 2004-07, which minimizes sampling problems, the probability of detection has a significantly negative effect on the probability of working in the shadow economy also for men (keeping the one for women) and is robust across different specifications.[13]

Pedersen (2003) reports negative effects of the subjectively perceived risk of detection on the probability of conducting undeclared work in the shadows for men in Denmark in 2001 (marginally significant), for men in Norway in 1998-2002 (highly significant),[14] men and women in Sweden in 1998 (highly significant in the first and marginally significant in the second case), and no significant effect for Great Britain in 2000. Moreover, van Eck and Kazemier (1988) report a significant negative of a high perceived probability of detection on participation in the hidden labor market for the Netherlands in 1982-83. In none of these studies were perceived fines and punishments included as explanatory variables. The large-scale survey done in Germany by Feld and Larsen (2005, 2009) thus appears to be the most careful analysis of deterrence effects on undeclared work to date.

Overall, this is far from convincing evidence of the proper working of government deterrence efforts. The reasons for this failure are discussed in the tax-compliance literature by Andreoni, Erard, and Feinstein (1998), Kirchler (2007), or Feld and Frey (2007). They range from interactions between tax morale and deterrence, where the fear of punishment overwhelms self-directed tax morale, to more mundane arguments, like the misperceptions of taxpayers. Likewise, these reasons could explain the poor performance of governments in deterring participation in the shadow economy. The known information on this comes mainly from survey studies, which may mean that the insignificant findings for fines and punishments also result from shortcomings in the survey design.

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[13] An earlier study by Merz and Wolff (1993) does not analyze the impact of deterrence on undeclared work.

[14] The earlier study by Isachsen and Strøm (1985) for Norway does not properly analyze the impact of deterrence on undeclared work either.

2.3.2 Tax and social-security contribution burdens

In contrast to deterrence, almost all studies demonstrate that the tax and social-security contribution burdens are among the main causes of the existence of the shadow economy.[15] Since taxes affect labor-leisure choices and stimulate the labor supply in the shadow economy, the distortion of the overall tax burden is a major concern. The bigger the difference between the total labor cost in the official economy and after-tax earnings (from work), the greater is the incentive to reduce the tax wedge and work in the shadow economy. Since the tax wedge consists of both social-security payments and the overall tax burden, these measures are key features of the existence and the growth of the shadow economy.

2.3.3 Intensity of regulations

Greater intensity of regulations, such as labor-market regulations, trade barriers, and labor restrictions on immigrants, is another aspect of national life that reduces the freedom (of choice) for individuals engaged in the official economy. Johnson, Kaufmann, and Zoido-Lobatón (1998b) find significant empirical evidence of the influence of (labor) regulations on the shadow economy; this impact is clearly described and theoretically derived in other studies as well, e.g., in Germany (*Deregulierungskommission*/Deregulation Commission 1991).[16] Regulations lead to a substantial run-up in the labor costs in the official economy. However, since most of these costs can be shifted to employees, regulations provide another incentive to work in the shadow economy, where they can be avoided. Johnson, Kaufmann, and Shleifer (1997) report empirical evidence supporting their model, which predicts that countries with higher general regulation of their economies tend to have a higher share of the unofficial economy in total GDP. They conclude that it is the enforcement of regulation that matters to firms and individuals, not the overall extent of regulation–mostly not enforced–and drives them into the shadow economy. Friedman, Johnson, Kaufmann, and Zoido-Lobaton (2000) arrive at a similar conclusion. In their study, every available measure of regulation is markedly correlated with the share of the unofficial economy, and the estimated sign of the relationship is unambiguous: more regulation is correlated with a larger shadow economy.

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[15] See Thomas (1992), Lippert and Walker (1997), Schneider (1994a, b, c, 1997, 1998a, b, 1999, 2000, 2003, 2005, 2009), Johnson, Kaufmann, and Zoido-Lobatón (1998a, b), Tanzi (1999), Giles (1999a), Mummert and Schneider (2001), Giles and Tedds (2002), and Dell'Anno (2003).

[16] The effect of regulation on the official and unofficial (shadow) economy was more recently investigated by Loayza, Oviedo, and Servén (2005a, b). Kucera and Roncolato (2008) extensively analyze the impact of labor-market regulation on the shadow economy.

2.3.4 Public-sector services

When a shadow economy enlarges, reduced state revenues follow in its wake, after which a lowering in the quality and quantity of publicly provided goods and services makes itself felt. Ultimately, this often leads to higher tax rates for companies and individuals in the official sector. Quite often, the combination of deteriorated public goods (such as the public infrastructure) and administration gives rise to even stronger incentives to jump into the shadow economy. Johnson, Kaufmann, and Zoido-Lobatón (1998a, b) present a simple model of this relationship. According to their findings, smaller shadow economies occur in countries with higher tax revenues achieved by having lower tax rates, fewer laws and regulations, and less bribery demanded of enterprises. Countries with a better rule of law, which is financed by tax revenues, also have smaller shadow economies. Transition countries tend to have higher levels of regulation in parallel with much higher levels of bribery, steeper effective taxes on official activities, and a large discretionary framework of regulations; consequently, there is a bigger shadow economy. Their overall conclusion is that "wealthier countries of the OECD, as well as some in Eastern Europe, find themselves in the 'good equilibrium' of a relatively low tax and regulatory burden, sizable revenue mobilization, a good rule of law and corruption control, and a [relatively] small unofficial economy. By contrast, a number of countries in Latin America and the former Soviet Union exhibit characteristics consistent with a 'bad equilibrium': tax and regulatory discretion and the burden on the business sector is high, the rule of law is weak, and there is a high incidence of bribery and a relatively high share of activities in the unofficial economy." (Johnson, Kaufmann, and Zoido-Lobatón 1998a, p. 1).

2.3.5 Other public institutions

Recently, various authors[17] have put forward the notion of the quality of public institutions being another key factor in the development of the informal sector. They argue that the efficient and discretionary application of tax systems and regulations by government may play a crucial role in the decision to conduct undeclared work, even more decisive than the actual burden of taxes and regulations. In particular, corruption in the bureaucracy and among other government officials seems to be associated with more unofficial activity, while a good rule of law, which secures property rights and enforces contracts, increases the benefits of being formal.

[17] See, e.g., Johnson et al. (1998a, b), Friedman et al. (2000), Dreher and Schneider (2009), Dreher, Kotsogiannis, and Macorriston (2007, 2009), as well as Teobaldelli (2011), Teobaldelli and Schneider (2012), Schneider (2010), and Buehn and Schneider (2012).

Hence, it is helpful to analyze theoretically and empirically the effect of political institutions, like the Federal political system, on the shadow economy. If the development of the informal sector is viewed as a consequence of the failure of political institutions to set up or run an efficient market economy (where entrepreneurs go underground when there is inefficient public-goods provision), then the incentive of this situation to the individual to operate unofficially can be assessed. In a Federal system, competition among jurisdictions and the mobility of individuals act as constraints on politicians to adopt policies that are closer to a majority of voters' preferences. Frequently, the most efficient policies are those that are characterized by a certain level of taxation, mostly spent on productive public services. In fact, production in the formal sector benefits from a higher provision of productive public services and is negatively affected by taxation, while the shadow economy reacts in the opposite way. As fiscal policy gets closer to a majority of voters' preferences in Federal systems, the size of the informal sector goes down. This results in the hypothesis that the size of the shadow economy should be lower in a Federal system than in a unitary state, all other things being equal. Moreover, Teobaldelli and Schneider (2012) assert that direct democracy has a quantitative and statistically significant influence on the size of the shadow economy: the more direct democratic elements a country has, the smaller the shadow economy, again all other things being equal.

2.3.6 Tax morale

In addition to the effect of incentives discussed above, the efficiency of the public sector has an indirect effect on the size of the shadow economy: it affects tax morale. As Feld and Frey (2007) argue, tax compliance is driven by a psychological tax contract that entails rights for and obligations from taxpayers and citizens on the one hand, but also from the state and its tax authorities on the other hand. Taxpayers are more inclined to pay their taxes honestly if they get valuable public services in exchange. However, most taxpayers are honest even when the benefit principle of taxation does not hold, i.e., for redistributive policies, if the political decisions underlying such policies are applied fairly. Finally, the treatment of taxpayers by the tax authority counts. If taxpayers are treated like partners in a (tax) contract instead of subordinates in a hierarchical relationship, they will fulfill their obligations within the psychological tax contract more willingly. Feld and Frey (2007) and Kirchler (2007) present comprehensive evidence of the influence of such factors on tax compliance.

Regarding the impact of tax morale on the shadow economy, there is scarce evidence. Using data on the shadow economy derived from the MIMIC

approach, Torgler and Schneider (2009) report the most convincing evidence for a negative effect of tax morale. They particularly address causality issues and establish a causal negative relationship between tax morale and the size of the shadow economy. This effect is also robust for the inclusion of additional explanatory factors and specifications. These findings are in line with earlier preliminary evidence by Körner et al. (2006). Underpinned by survey data, Feld and Larsen (2005, 2009) likewise report a robust negative effect of tax morale in particular and social norms in general on the probability of respondents to conduct undeclared work. Interestingly, the estimated effects of social norms are quantitatively more important than the estimated deterrence effects. Van Eck and Kazemier (1988) also report a marginally significant effect of tax morale on participation in the hidden labor market.

2.3.7 Summary of the main causes of the shadow economy

In Table 2.2, an overview of a number of empirical studies summarizes the various factors influencing the shadow economy. The overview is based on studies where the size of the shadow economy was measured by the MIMIC or currency-demand approach. As there is no evidence of successful deterrence from these approaches–at least with respect to the broad panel data base on which this table draws–the most central policy variable does not show up. This is an obvious shortcoming of the studies, and it cannot be coped with easily due to the lack of internationally comparable deterrence data. In Table 2.2, two columns are presented, showing the various factors affecting the shadow economy with and without the independent variable of "tax morale." This table clearly demonstrates that an increase in taxes and social-security contributions is by far the single biggest contributor to expansion of the shadow economy. Indeed, this factor explains 35-38% or 45-52% of the variance in the shadow economy, with or without the inclusion of tax morale. When it is factored in, the variable tax morale accounts for 22-25% of variance in the shadow economy,[18] while "quality of state institutions" accounts for 10-12%, followed by "intensity of state regulation" (mostly for the labor market) with 7-9%. In general, Table 2.2 shows that the independent variable of the burden comprised of taxes and social-security payments, followed by those of tax morale and intensity of state regulations, are the three prime driving forces of the shadow economy.

[18] The importance of this variable with respect to theory and empirical relevance is also shown in Frey (1997), Feld and Frey (2002a, 2002b, 2007), and Torgler and Schneider (2009).

Table 2.2 Main Causes of the Increase of the Shadow Economy

Variable	Influence on the shadow economy (in %) [1)]	
	(a)	(b)
(1) Tax and Social-Security Contribution Burdens	35-38	45-52
(2) Quality of State Institutions	10-12	12-17
(3) Transfers	5-7	7-9
(4) Specific Labor-Market Regulations	7-9	7-9
(5) Public-Sector Services	5-7	7-9
(6) Tax Morale	22-25	-
Influence of all Factors	84-98	78-96

(a) Average values of 12 studies.
(b) Average values of empirical results of 22 studies.
Source: Schneider (2009)
[1)] This is the normalized or standardized influence of the variable average over the 12 studies in column (a) and the 22 studies in column (b)

3. Size and Progession of the Shadow Economies in 36 Countries

In Tables 3.1 to 3.4, the size of 31 European and five non-European shadow economies over the 2003-13 period is presented.[19] The size of the shadow economy of Turkey[20] had a value of 32.2% of official GDP in the year 2003,

[19] The calculation of the size and growth of the shadow economy is done with the MIMIC (Multiple Indicators and Multiple Courses) estimation procedure. Using the MIMIC estimation procedure, one gets only relative values, so one needs other methods, like the currency-demand approach, to calibrate the MIMIC values into absolute ones. For a detailed explanation, see Friedrich Schneider, editor, *Handbook on the Shadow Economy*, Cheltenham (UK): Edward Elgar Publishing Company, 2011.

[20] In this paper, the size and recent history of the shadow economy of Turkey, estimated by other authors, are not discussed anew. The most famous estimate, which runs from 1950 to 2010, comes from Elgin and Öztunali (2012). The size and development of the shadow economy of North-Cyprus is also not presented and discussed here. See, for example, Besim and Ekici (2013).

which then steadily declined to 28.4% by 2008, inched up to 28.9% in 2009, and has since fallen back to 26.5% in 2013 (forecast).[21] Among the western neighbors of Turkey, Bulgaria and Greece, the former had a shadow economy of 35.9% in 2003, which went down to 32.1% in 2008 but came back up to 32.5% in 2009, only to retreat again to 31.2% in 2013 (forecast). In Greece, there was a shadow economy of 28.2% in 2003, which shrank to 24.3% in 2008, expanded to 25.0% in 2009, but reversed itself to 23.6% in 2013 (forecast). On an EU-wide basis across all 27 member states, the average shadow economy in 2003 was 22.3% of official GDP, dipped to 19.2% in 2008, rose to 19.8% in 2009, and sank again, to 18.4%, in 2013 (Table 3.1). By comparison, the average of 31 European countries was 22.4% in 2003, 19.4% in 2008, 19.9% in 2009, and 18.5% in 2013 (Table 3.2). The history of the shadow economies of Australia, Canada, Japan, New Zealand, and the US display a similar movement over time (see Table 3.3)*;* in 2013, these five countries had, on average, a shadow economy that represented 8.6% of GDP, down from 9.7% in 2010.

If we look at the last two years (2012 and 2013) and compare them with 2008, we realize that most countries have experienced a contraction in the size of their "black" economies. This is due to the recovery from the worldwide economic and financial crises, which illustrates a noteworthy point: if an official economy is recovering or even booming, people have less incentive to undertake additional activities in the shadow economy and earn extra "black" money there. The only exceptions are Greece and Spain, where the recession in the official economy has been so severe as to even cut demand in the shadow economy, thanks to the traumatic hollowing out of the living standards of much of the populations in those countries. As a result, the Greek and Spanish shadow economies will fall back to 23.6% of official GDP in 2013, a lessening of 0.4 percentage point from 2012!

In Table 3.5, the shadow economies of Moldova, Ukraine, Romania, and Turkey are presented. Ukraine was in first place in 2000, with a value of 52.2% of official GDP, but by 2012 it had improved to 44.2% (forecast).

[21] The calculated values for 2013 are projections based on the forecasts of the official figures (GDP, unemployment, etc.) of these countries.

Table 3.1. Size of the Shadow Economy of 27 European Countries in 2003-13 (in % of off. GDP)

Country / Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Austria	10.8	11	10.3	9.7	9.4	8.1	8.47	8.2	7.9	7.6	7.5
Belgium	21.4	20.7	20.1	19.2	18.3	17.5	17.8	17.4	17.1	16.8	16.4
Bulgaria	35.9	35.3	34.4	34	32.7	32.1	32.5	32.6	32.3	31.9	31.2
SouthCyprus	28.7	28.3	28.1	27.9	26.5	26	26.5	26.2	26	25.6	25.2
Czech Republic	19.5	19.1	18.5	18.1	17	16.6	16.9	16.7	16.4	16.0	15.5
Denmark	17.4	17.1	16.5	15.4	14.8	13.9	14.3	14	13.8	13.4	13.0
Estonia	30.7	30.8	30.2	29.6	29.5	29	29.6	29.3	28.6	28.2	27.6
Finland	17.6	17.2	16.6	15.3	14.5	13.8	14.2	14	13.7	13.3	13.0
France	14.7	14.3	13.8	12.4	11.8	11.1	11.6	11.3	11	10.8	9.9
Germany	17.1	16.1	15.4	15	14.7	14.2	14.6	13.9	13.7	13.3	13.0
Greece	28.2	28.1	27.6	26.2	25.1	24.3	25	25.4	24.3	24.0	23.6
Hungary	25	24.7	24.5	24.4	23.7	23	23.5	23.3	22.8	22.5	22.1
Ireland	15.4	15.2	14.8	13.4	12.7	12.2	13.1	13	12.8	12.7	12.2
Italy	26.1	25.2	24.4	23.2	22.3	21.4	22	21.8	21.2	21.6	21.1
Latvia	30.4	30	29.5	29	27.5	26.5	27.1	27.3	26.5	26.1	25.5
Lithuania	32	31.7	31.1	30.6	29.7	29.1	29.6	29.7	29.0	28.5	28.0
Luxembourg	9.8	9.8	9.9	10	9.4	8.5	8.8	8.4	8.2	8.2	8.0
Malta	26.7	26.7	26.9	27.2	26.4	25.8	25.9	26	25.8	25.3	24.3
Netherlands	12.7	12.5	12	10.9	10.1	9.6	10.2	10	9.8	9.5	9.1
Poland	27.7	27.4	27.1	26.8	26	25.3	25.9	25.4	25	24.4	23.8
Portugal	22.2	21.7	21.2	20.1	19.2	18.7	19.5	19.2	19.4	19.4	19.0
Romania	33.6	32.5	32.2	31.4	30.2	29.4	29.4	29.8	29.6	29.1	28.4
Slovenia	26.7	26.5	26	25.8	24.7	24	24.6	24.3	24.1	23.6	23.1
Spain	22.2	21.9	21.3	20.2	19.3	18.4	19.5	19.4	19.2	19.2	18.6
Slovakia	18.4	18.2	17.6	17.3	16.8	16	16.8	16.4	16	15.5	15.0
Sweden	18.6	18.1	17.5	16.2	15.6	14.9	15.4	15	14.7	14.3	13.9
United Kingdom	12.2	12.3	12	11.1	10.6	10.1	10.9	10.7	10.5	10.1	9.7
27 EU-Countries / Average (unweighted)	**22.3**	**21.9**	**21.5**	**20.8**	**19.9**	**19.2**	**19.8**	**19.6**	**19.2**	**18.9**	**18.4**

Source: Own Calculations, December 2012

Table 3.2. Size of the Shadow Economy of Four European Countries (Non EU-Members) in 2003-13 (in % of off. GDP)

Country / Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Croatia	32.3	32.3	31.5	31.2	30.4	29.6	30.1	29.8	29.5	29.0	28.4
Norway	18.6	18.2	17.6	16.1	15.4	14.7	15.3	15.1	14.8	14.2	13.6
Switzerland	9.5	9.4	9	8.5	8.2	7.9	8.3	8.1	7.8	7.6	7.1
Turkey	32.2	31.5	30.7	30.4	29.1	28.4	28.9	28.3	27.7	27.2	26.5
4 Non EU-Countries / Average	**23.2**	**22.9**	**22.2**	**21.6**	**20.8**	**20.2**	**20.7**	**20.3**	**19.9**	**19.5**	**18.9**
Unweighted Average of all 31 European Countries	**22.4**	**22.1**	**21.6**	**20.9**	**20.1**	**19.4**	**19.9**	**19.7**	**19.3**	**19.0**	**18.5**

Source: Own Calculations, December 2012

Table 3.3. Size of the Shadow Economy of Five Highly Developed Non- European Countries in 2003-13 (in % of off. GDP)

Country / Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Australia	13.7	13.2	12.6	11.4	11.7	10.6	10.9	10.3	10.1	9.8	9.4
Canada	15.3	15.1	14.3	13.2	12.6	12	12.6	12.2	11.9	11.5	10.8
Japan	11	10.7	10.3	9.4	9	8.8	9.5	9.2	9	8.8	8.1
New Zealand	12.3	12.2	11.7	10.4	9.8	9.4	9.9	9.6	9.3	8.8	8.0
United States	8.5	8.4	8.2	7.5	7.2	7	7.6	7.2	7	7.0	6.6
Other OECD Countries / Unweighted Average	**12.16**	**11.92**	**11.42**	**10.38**	**10.06**	**9.56**	**10.1**	**9.7**	**9.46**	**9.18**	**8.6**

Source: Own Calculations, December 2012

Table 3.4. Size of the Shadow Economy of Various Groupings in 2003-13 (in % of off. GDP)

Averages / Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
27 EU-Countries / Average (unweighted)	22.3	21.9	21.5	20.8	19.9	19.3	19.8	19.5	19.4	18.9	18.4
4 Non EU-Countries / Average (unweighted)	23.2	22.9	22.2	21.6	20.8	20.2	20.7	20.3	20.0	19.5	18.9
5 Other OECD Countries / Average (unweighted)	12.2	11.9	11.4	10.4	10.1	9.6	10.1	9.7	9.5	9.18	8.6
All 36 Countries / Average (unweighted)	**21.0**	**20.7**	**20.2**	**19.4**	**18.7**	**18.0**	**18.5**	**18.3**	**18.0**	**17.6**	**17.1**

Source: Own Calculations, December 2012

Table 3.5. Size of the Shadow Economies of Moldova, Ukraine, and Romania in 2000-10, Based on the MIMIC Method Forestimation and Benchmark Values from the Currency-Demand Method

Country	Size of the shadow economy in % of real GDP												
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Moldova	45.3%	44.2%	43.8%	43.5%	43.0%	42.8%	42.5%	42.3%	42.0%	42.3%	41.8%	40.7%	40.2%
Ukraine	52.2%	51.4%	50.8%	49.7%	48.8%	47.8%	47.3%	46.8%	46.2%	46.2%	45.1%	44.6%	44.2%
Romania	34.4%	33.9%	33.6%	33.6%	32.5%	32.2%	31.4%	30.2%	29.4%	29.4%	29.8%	29.6%	29.1%
Turkey	--	--	--	32.2%	31.5%	30.7%	30.4%	29.1%	28.4%	28.9%	28.3%	27.7%	27.2%

Source: Calculation by Friedrich Schneider, University of Linz, Austria, August 2012.

Next comes Moldova, with a value of 45.3% in 2000, dropping to 42.0% in 2008, rising slightly to 42.3% in 2009, and then settling at 40.2% in 2012 (forecast). Romania had the smallest shadow economy in this group, with 34.4% in 2000; after more than a decade of steady progress, it reached 2012 with a far better value: 29.1% (forecast).

Three interesting facts emerge in connection with the size of the shadow economies:

(1) The eastern countries, or the "new" European Union members, such as Bulgaria, South-Cyprus, the Czech Republic, Latvia, Lithuania, and Poland have larger shadow economies than such "old" European Union countries as Austria, Belgium, Germany, and Italy; therefore, one can observe that the size of the shadow economy grows as we move from west to east.

(2) A similar phenomenon is seen on a north-south axis. On average, the southern European countries have considerably larger shadow economies than do those of Central and Western Europe. This is confirmed in Figures 3.1 and 3.2.

(3) The five other highly developed OECD countries (Australia, Canada, Japan, New Zealand, and the United States, in Table 3.3) have much smaller shadow economies, with 10.1 % of GDP on average in 2009, which tumbled to 9.2% in 2012.

4. Shadow Economies in Highly Developed OECD Countries: What are the Driving Forces?

Two papers, by Friedrich Schneider and Andreas Buehn, 2013, and Andreas Buehn and Friedrich Schneider, 2012, described new investigations to tackle two questions:

(1) What are the driving forces of the shadow economy in highly developed OECD countries?

(2) Can we calculate the extent of tax evasion in OECD countries over the 1999-2010 period[22]?

[22] Compare with the studies of Schneider, Friedrich and Buehn, Andreas (2013) and Buehn and Schneider (2012).

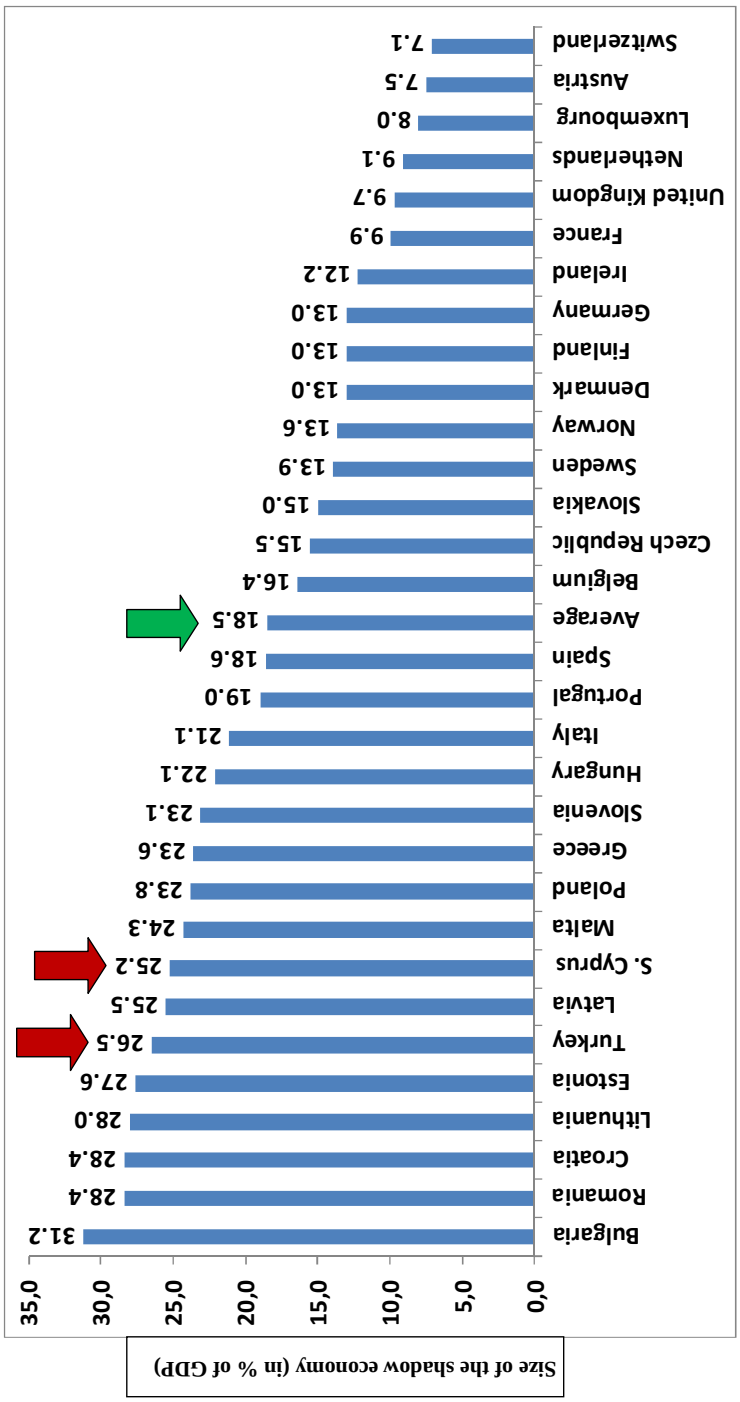

Figure 3.1. Size of the Shadow Economy of 31 European Countries in 2013 (in % of off. GDP)

Source: Own calculations, December 2012

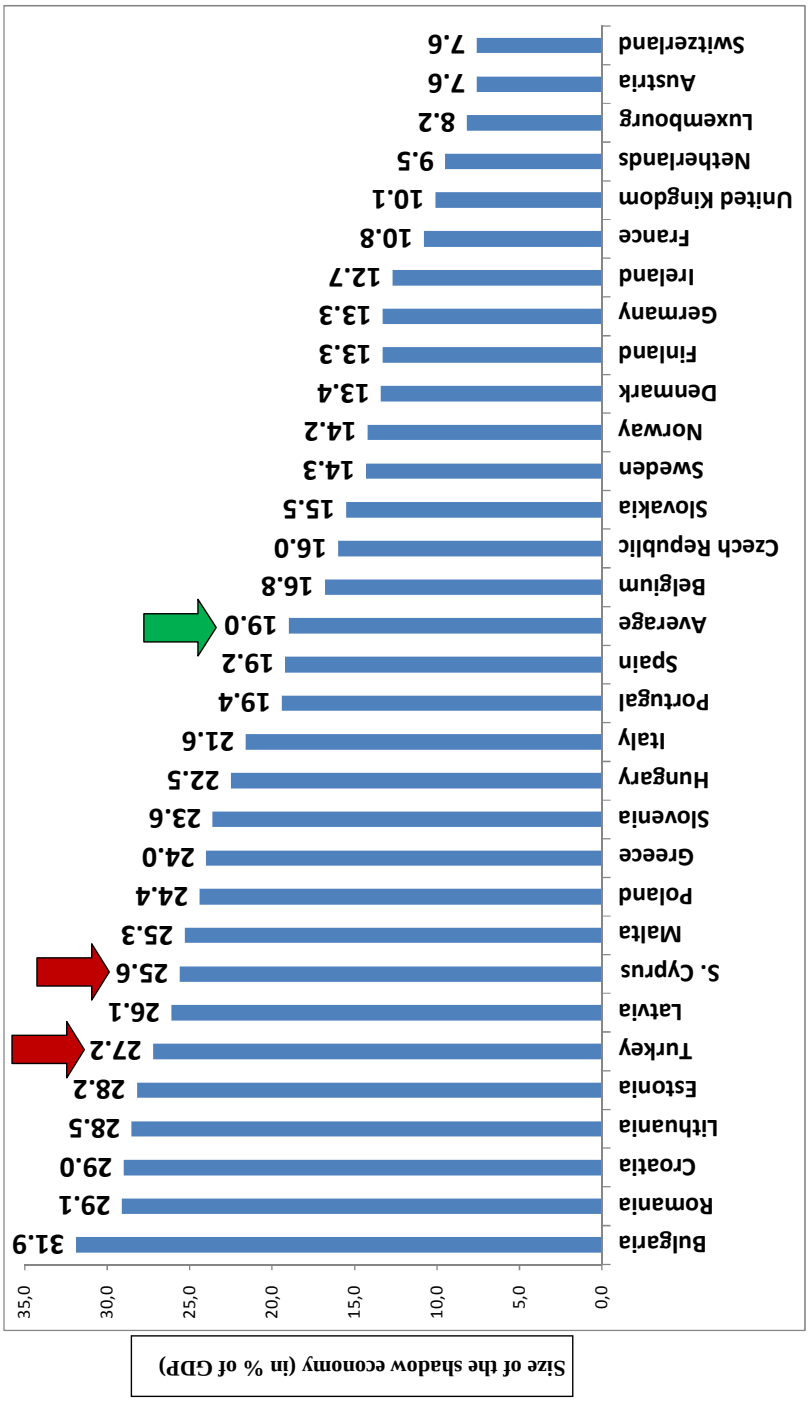

Figure 3.2. Size of the Shadow Economy of 31 European Countries in 2012 (in % of off. GDP)

Source: Own calculations, March 2012

Table 4.1. Average Relative Impact (in %) of the Causal Variables on the Shadow Economy of 38 OECD Countries from 1999 to 2010

Country	Average size of the shadow economy	Personal income tax	Indirect taxes	Tax morale	Unem-ployment	Self-employ-ment	GDP growth	Business freedom
Australia	13.8	12.4	13.4	14.1	18.1	15.8	13.2	13.0
Austria	9.8	12.4	14.6	14.1	11.8	16.8	15.9	14.4
Belgium	21.5	12.9	12.8	14.4	16.2	16.0	14.2	13.3
Bulgaria	34.6	14.9	13.5	14.8	14.8	14.2	13.7	14.2
Canada	15.6	12.7	14.9	14.9	18.4	11.7	13.8	13.6
Chile	19.4	16.1	14.1	14.1	14.2	12.9	14.4	14.3
South-Cyprus	27.2	13.8	14.5	14.5	14.3	14.5	13.8	14.6
Czech Rep.	17.6	15.1	16.0	14.0	11.5	13.1	14.3	15.9
Denmark	17.3	10.8	13.1	14.7	18.2	15.6	14.4	13.2
Estonia	21.7	16.4	14.4	14.5	12.4	13.1	14.0	15.2
Finland	17.4	15.4	13.0	14.8	12.9	16.9	13.7	13.3
France	14.8	9.1	14.4	14.8	15.1	17.3	15.1	14.3
Germany	15.7	16.6	13.2	15.0	13.0	12.8	15.2	14.2
Greece	27.0	10.3	16.2	14.5	10.4	18.7	14.3	15.5
Hungary	24.1	14.0	14.1	15.0	15.0	14.2	13.5	14.2
Iceland	15.2	12.4	14.3	14.7	15.1	14.4	14.8	14.3
Italy	26.9	13.0	13.9	14.0	14.5	14.0	16.6	13.9
Korea	26.3	13.3	14.4	14.9	13.3	14.6	15.3	14.2
Latvia	22.2	14.6	14.3	13.9	15.1	14.6	13.3	14.2
Lithuania	25.4	13.1	14.5	14.1	15.1	14.5	14.2	14.5
Luxembourg	9.6	14.7	14.3	14.2	13.0	14.9	14.5	14.3
Malta	27.3	14.3	14.3	15.1	14.3	14.3	13.4	14.3
Mexico	30.0	14.3	13.7	14.5	14.4	14.2	14.9	13.9
Netherlands	13.2	14.6	13.6	14.0	16.1	13.7	14.2	13.8
New Zealand	12.2	14.6	14.2	14.2	15.2	14.3	13.2	14.2
Norway	18.6	14.1	13.8	14.2	14.1	14.5	15.4	13.9
Poland	26.4	14.1	14.4	14.4	14.2	14.5	14.1	14.4
Portugal	22.7	12.5	14.1	14.9	14.2	14.4	15.9	14.1
Romania	32.2	15.5	14.2	13.9	14.2	14.1	14.0	14.2
Slovak Rep.	17.5	15.0	14.7	14.7	14.4	14.4	12.0	14.8
Slovenia	25.2	14.4	14.3	14.4	14.8	14.4	13.2	14.4
Spain	22.8	11.2	13.6	14.6	17.5	16.4	13.8	12.9
Sweden	18.6	14.9	14.3	14.6	13.3	14.2	14.2	14.5
Switzerland	8.3	13.8	13.0	15.7	13.4	14.4	14.8	14.8
Turkey	30.6	13.9	14.1	14.5	13.7	14.5	15.1	14.3
United Kingdom	12.5	13.6	14.0	14.3	18.1	12.4	13.7	14.0
United States	8.7	13.9	14.1	13.7	14.9	14.4	15.0	14.1
Average	20.3	13.8	14.1	14.5	14.6	14.6	14.3	14.2

Source: Schneider and Buehn (2013).

Table 4.2. Extent of Tax Evasion (in % of GDP) in 38 OECD Countries, Assuming Indirect Taxation and Self-Employment as Driving Forces

Country	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Average
Australia	2.1	2.0	2.0	2.0	2.0	1.9	1.9	1.8	1.7	1.5	1.5	1.6	1.8
Austria	1.6	1.5	1.4	1.5	1.5	1.5	1.5	1.4	1.3	1.2	1.1	1.4	1.4
Belgium	2.8	2.6	2.6	2.6	2.7	2.6	2.6	2.4	2.2	2.0	1.9	2.1	2.4
Bulgaria	6.8	6.4	6.2	6.3	6.4	6.1	5.9	5.5	5.1	4.8	4.4	4.8	5.7
Canada	2.1	2.0	2.0	2.0	2.0	2.0	1.9	1.8	1.7	1.5	1.5	1.7	1.9
Chile	4.5	4.2	4.1	4.2	4.3	4.1	4.0	3.7	3.5	3.3	3.4	3.7	3.9
South-Cyprus	6.3	5.9	5.7	5.8	6.0	5.9	5.7	5.3	5.0	4.7	4.4	4.5	5.4
Czech Rep.	3.4	3.2	3.2	3.2	3.3	3.2	3.0	2.8	2.5	2.1	2.1	2.3	2.9
Denmark	2.6	2.4	2.4	2.5	2.5	2.4	2.4	2.2	2.0	1.7	1.7	1.9	2.2
Estonia	-	3.7	3.6	3.7	3.7	3.5	3.4	3.1	2.9	2.5	2.8	2.8	3.2
Finland	2.7	2.5	2.4	2.5	2.5	2.5	2.4	2.2	2.1	1.9	1.8	2.0	2.3
France	2.0	1.9	1.8	1.9	1.9	1.9	1.8	1.7	1.6	1.4	1.4	1.6	1.7
Germany	2.2	2.1	2.0	2.1	2.2	2.1	2.1	1.9	1.8	1.6	1.5	1.7	1.9
Greece	5.6	5.3	5.2	5.3	5.3	5.1	5.0	4.6	4.4	4.0	3.7	4.0	4.8
Hungary	4.5	4.2	4.1	4.1	4.2	4.1	4.0	3.7	3.6	3.2	3.0	3.3	3.8
Iceland	3.0	2.9	2.8	2.9	3.0	2.8	2.7	2.5	2.3	2.0	2.1	2.3	2.6
Ireland	3.1	2.9	2.8	2.9	3.0	2.9	2.8	2.6	2.6	2.4	2.5	2.6	2.8
Italy	4.6	4.2	4.1	4.2	4.4	4.3	4.2	4.0	3.8	3.4	3.3	3.6	4.0
Korea	6.7	6.2	6.0	6.1	6.2	6.0	5.9	5.5	5.2	4.7	4.3	4.8	5.6
Latvia	3.7	3.5	3.4	3.4	3.4	3.3	3.2	2.9	2.7	2.7	2.3	2.7	3.1
Lithuania	4.1	3.9	3.8	3.8	3.8	3.6	3.5	3.2	3.1	3.1	2.7	3.2	3.5
Luxembourg	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.2	1.1	1.0	1.2	1.3

Table 4.2. Extent of Tax Evasion (in % of GDP) in 38 OECD Countries, Assuming Indirect Taxation and Self-Employment as Driving Forces

Country	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Average
Malta	5.5	5.2	5.1	5.3	5.4	5.3	5.2	4.8	4.6	4.2	4.0	4.6	4.9
Mexico	7.7	7.1	7.1	7.3	7.5	7.2	7.1	6.5	6.1	5.8	5.6	6.2	6.8
Netherlands	2.3	2.1	2.1	2.2	2.3	2.2	2.2	2.0	1.9	1.7	1.7	1.9	2.0
New Zealand	2.1	1.9	1.9	1.9	1.9	1.8	1.8	1.7	1.6	1.5	1.4	1.6	1.8
Norway	2.8	2.7	2.6	2.7	2.7	2.6	2.6	2.4	2.3	2.0	2.0	2.2	2.5
Poland	4.9	4.6	4.6	4.7	4.8	4.6	4.5	4.2	3.8	3.4	3.2	3.5	4.2
Portugal	4.6	4.3	4.2	4.4	4.6	4.5	4.4	4.2	3.9	3.4	3.3	3.7	4.1
Romania	7.0	6.7	6.5	6.6	6.6	6.3	6.2	5.6	5.4	5.0	4.6	5.2	6.0
Slovak Rep.	2.8	2.7	2.6	2.7	2.7	2.6	2.5	2.3	2.1	1.9	1.8	1.9	2.4
Slovenia	5.0	4.7	4.6	4.7	4.8	4.6	4.5	4.1	4.0	3.5	3.2	3.6	4.3
Spain	3.2	3.0	2.9	3.0	3.0	3.0	2.9	2.8	2.6	2.5	2.5	2.7	2.8
Sweden	2.8	2.6	2.6	2.6	2.7	2.6	2.5	2.4	2.2	2.0	1.9	2.2	2.4
Switzerland	1.6	1.5	1.4	1.5	1.6	1.5	1.4	1.3	1.2	1.0	1.0	1.2	1.4
Turkey	7.8	7.3	7.4	7.5	7.5	7.1	6.8	6.3	5.7	5.3	5.3	5.7	6.7
UK	2.1	1.9	1.9	1.9	2.0	1.9	1.9	1.8	1.7	1.5	1.6	1.6	1.8
United States	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5
Average	3.6	3.4	3.4	3.4	3.5	3.4	3.3	3.1	2.9	2.6	2.5	2.8	3.2

Source: Buehn and Schneider (2012).

Table 4.1 shows the average relative impact (in percent) of the shadow-economy determinants in 38 OECD countries over the 1999-2010 period. Unemployment and self-employment obviously had the greatest average impact, 14.6%, on the shadow economies of the 38 OECD countries during this-time. The second strongest determinant was tax morale, with 14.5%, followed by GDP growth at 14.3% and business freedom at 14.2%. Turkey has a slightly different profile. GDP growth was the strongest shaper of the size of the Turkish shadow economy, with 15.1%, followed by tax morale and self-employment (14.5%), then business freedom (14.3%).

Finally, Table 4.2 lays out the bite that tax evasion takes out of the official GDP in 38 OECD countries, with indirect taxation and self-employment assumed to be driving forces. Notably, from an OECD-wide average tax-evasion rate of 3.6% in 1999, an improvement in tax compliance was registered by 2010: tax evasion had fallen to 2.8%. In Turkey, the value was 7.8% in 1999, which more or less steadily fell (with some ups and downs) to 5.7% by 2010. That means that the Turkish government was, to a certain extent, successful in fighting tax evasion.[23]

5. Concluding Remarks

In general, it appears that dynamic and interesting features characterize shadow economies and their causative factors, with a different profile of these showing up in each of these 38 OECD countries. Also, the tax-evasion figures point to a variety of situations throughout the OECD, and they have been computed for the first time on a longer time-series basis, to be presented here.

[23] The precise calculation that produced these figures is shown in the paper by Buehn and Schneider (2012). The figures were developed from a MIMIC estimation of the shadow economies of these 38 countries. A shadow economy is broken down into illegal and "legal" (explicit) activities (those carried out in the shadow economy, e.g., repairing a car or building a house), from which the tax-evasion figures were derived.

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