DANIEL S WILLS

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Undergraduate Studies:
B.S. in mathematics, Universidad de Los Andes, 2009
B.A. in economics, Universidad de Los Andes, 2010

Masters Level Work:
M.A. in economics, Universidad de Los Andes, 2011

Doctoral Studies:
University of Pennsylvania, 2011 to present
Expected Completion Date: May 2017

Thesis Committee and References:

Professor Harold Cole (co-Advisor)
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Professor Dirk Krueger (co-Advisor)
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Professor Ali Shourideh
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Professor Joao Gomes
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Research Fields:
Macroeconomics, Public Finance, Financial Economics.

Teaching Experience:

University of Pennsylvania

Instructor	International Economics (Spring 2016); Labor Economics (Fall 2013)
Teaching Assistant	Introduction for Economics for Business (Fall 2012, Fall2014, Fall 2015), for Professor Gizem Saka; Intermediate Microeconomics (Spring 2014), for Professor Kenneth Burdett; International Economics (Spring 2015) for Professor Iourii Manovski; Arts and Economics (Spring 2013), Labor Economics (Spring 2013) for Professor Gizem Saka.

Universidad de Los Andes

Instructor	Differential Calculus (Fall 2008)
Teaching Assistant	Multivariate Calculus for Economists and Business Managers (Spring 2008)

Research Experience and Other Employment:

Fall 2016	Dissertation internship at the Federal Reserve Bank of St. Louis.
Summer 2016	Dissertation internship at the Board of Governors of the Federal Reserve System.
Summer 2015, 2014	Research assistant for Professor Ali Shourideh.
Summer 2013	Visiting scholar at Fedesarrollo.
2009 - 2011	Research assistant at Fedesarrollo.
2008 - 2009	Research assistant at Universidad de Los Andes.

Other Professional Activities:

Referee for the *International Economic Review, ILR Review* and *Desarrollo y Sociedad*

Research Papers:

"Taxing Firms Facing Financial Frictions", with Gustavo Camilo (Job Market Paper)

Abstract: We investigate optimal taxation of capital in the context of the current tax system, where it incurs dividend, interest, capital gains, and corporate profits taxes. In our environment, these taxes are not perfect substitutes. In particular, taxing at the corporate income level decreases net worth delaying capital accumulation by constrained, growing firms. When capital gains can be taxed on accrual, replacing the corporate income tax by a common tax on shareholders that preserves budget balance monotonically increases TFP and results in higher consumption in steady state. Quantitatively, steady state TFP is 2.1% higher under the described policy compared to the benchmark case.

"Fighting for the Best, Losing with the Rest: On the Desirability of Competition in Financial Markets", with Juan Hernandez

Abstract: We study the credit market for firms that lack collateral and have a large uncertainty about their ability to generate any profit -such as business start-ups- by characterizing optimal financial contracts in a competitive environment with risk, adverse selection and limited liability. We find that competition among financial intermediaries always forces them to fund projects with negative expected returns both from a private and from a social perspective, providing a justification for regulating financial intermediaries. The three ingredients: competition, adverse selection and limited liability are necessary to get the inefficient outcome. Allowing for some collateral reduces but does not completely eliminate the inefficiency.

Work in Progress

"Optimal Income Taxes and Entrepreneurial Choice", with Ali Shourideh and Juan Hernandez

Abstract: We characterize optimal business and labor income tax schedules in an environment in which agents can choose to be entrepreneurs or workers. Agents privately observe their skill for each occupation and also privately decide the corresponding investment and effort intensities. The different nature of the incentive structure in each sector results in a distortion of the occupational choice margin, and the resulting sector specific tax schedules are different than they would be in a world without sector mobility. In the case where workers supply hours inelastically, a Rawlsian planner sets the marginal tax on labor income always higher than the marginal tax on operating profits; in particular consumption is not equalized among workers.

Publications (pre-PhD):

"Labor Market Rigidities and Informality in Colombia", with Camilo Modragón-Vélez and Ximena Peña, *Economía*, Vl.11, No1 (Fall 2010), pp 65-101.

Abstract: Informality is at the center of the economic debate in Colombia, fueled by the high level prevalent in the country and its substantial increase during the 1990s. We study the effect of labor market rigidities, namely the increase in non-wage costs and the minimum wage on the size of the informal sector, the transition into and out of informality, and wages. Our results indicate that rises in non-wage costs and the minimum wage, increase the probability of transition into informality as well as the size of the informal sector. The analysis of these effects along the income distribution points towards strong exclusion motives for low skilled informal workers, mainly driven by labor demand adjustments in response to increasing hiring costs; and argues somehow in favor of exit motives for workers at the top of the wage distribution. Furthermore, there is strong indexation of salaries to the minimum wage, except for low skilled informal workers. In addition, firms adjust salaries in response to increasing non-wage costs for all workers within the labor force.

Computer Skills:

Julia, Stata, Matlab, C++, Office

Languages:

Spanish (native), English (fluent), French (bilingual)

RESEARCH PROPOSAL

Taxing Capital Income: Where and How?

Daniel Wills

Project Summary

I aim to quantitatively characterize the optimal (linear) tax rates for dividends, interests, capital gains and corporate profits in a general equilibrium model where firms face external financing frictions and optimally choose their capital structure. In a first step, I will use the recent estimates for tax elasticities from Zwick et al. (2014) and Yagan (2015) to calibrate the model. The second step is to proceed to solve the Ramsey taxation problem (computationally). While dividend taxes do not distort optimal policies for firms with positive cash holdings, they create a wedge between firms and investors when the former issue equity to raise funds. That's particularly important for firms with limited credit lines due to low collateral. The corporate income tax harms financially constrained firms who would like to save as quickly as possible to relax their constraints. On the other hand, by limiting the capacity to accumulate assets, the corporate income tax also accelerates exit by low productivity firms and hence increases steady state TFP. The benevolent government trades off these forces and optimally sets positive rates on all four instruments.

PROJECT DESCRIPTION

Background

Capital income is taxed several times and at different rates in the United States and most countries around the world. It is first taxed at the firm level, as corporate income. Then, individuals pay taxes on dividends and on capital gains. Income from interests is also taxed, at the personal income rate. In environments with financial frictions -where firms' policies depend on cash flows- the different rates listed above have different implications on firm behavior and economic welfare. This is in contrast with the neoclassical growth model and similar environments where the capital structure of the firm is irrelevant. However, most of the optimal taxation literature has focused on the later environments, and as a result is not informative about how the different tax rates listed above should compare. The objective of the research project proposed here is to contribute to filling that gap. In my job market paper I looked at a simple case where the corporate income tax is replaced by a common tax on shareholders. However, for this project I relied on the assumption that capital gains are taxed on accrual (for modeling and computational simplicity). Once the (unrealistic) assumption of taxing capital gains on accrual is relaxed, there is a trade-off and the optimal rates can be computed.

Contribution

An important result by Auerbach (1979), Bradford (1981) and King (1974) gives a strong argument to tax capital income *only* at the dividend level: "taxes on the dividends ultimately paid from retained earnings may be capitalized into share values and not affect the decision to reinvest such earnings" (Auerbach (2013)). The result, referred to as "the new view" on dividend taxation, is in contrast with a "traditional view" (Harberger (1962), Harberger (1966)) which assumed the marginal source of investment is equity, and hence dividend taxes would distort investment.

However, the modern corporate finance literature shows that firms optimally choose when and how to combine retained earnings, debt or equity issuances in order to finance investment (See for instance, Gomes (2001), Hennessy and Whited (2005), Hennessy and Whited (2007)). Under such a firm theory, the "new view" does not hold, and the benefits of taxing dividends need to be balanced with the distortions it introduces. Financial frictions play a key role in breaking the result, and as a consequence, they will also play a key role in understanding the optimal policy.

I borrow the main ingredients from corporate finance models cited above -costly equity issuance, restrictions to debt- and construct an environment in which firms optimally choose their capital structure. As a result, dividends, capital gains, debt, and corporate income are endogenous. That allows us to study how firms' optimal policies change with taxes, and ultimately what the optimal relative rates are.

Main Mechanisms

Consistent with the new view, in our environment dividend taxes do not distort firms' policies for cash rich firms. However they decrease firm value and create a wedge between investors and firms issuing equity, hence distorting the interest rate. They also distort firms' policies when they choose to issue equity. By contrast, corporate income and capital gains taxes do distort firms' policies when distributions are positive. The corporate income tax does not distort the optimal policies only when all expenditures are deductible and firms have enough liquidity to fund the desired investment in every state of the world. It is particularly harmful for constrained growing companies who would like to invest all their before tax earnings in order to relax the constraints. On the other hand, by limiting the capacity to accumulate assets, the corporate income tax also accelerates exit by low productivity firms and hence increases steady state TFP. Capital gains taxes distort firm's discounting introducing a bias toward the present (since investment generally increases firm value, accruing capital gains). Hence it reduces the steady state capital stock.

Data

As a first check of our model, I plan to use publicly available data of listed firms in the United States (COMPUSTAT). I aim to test the predictions of the model using the 2003 tax cut in the United States. The reform reduced the tax rate on dividends and capital gains to to 15%[1]. The empirical effects of the reform on firm behavior are documented by Chetty and Saez (2005). We expect the model to be consistent with the change in behavior found as long as the reform was perceived as temporary. This is consistent with the way the regulation was introduced: when the reform was signed into law, it was set to expire in 2008.

[1]Before the reform, dividends where taxed at the individual income rate which varies depending on income, and tops at 35%. Capital gains where taxed at 20%

There are two shortcomings of COMPUSTAT for our research question. First, the database only has information from publicly traded firms. Second, the U.S. financial sector is more developed and efficient compared to the one is in less developed countries such as Chile. As a result, COMPUSTAT may not be the best sample to study the interaction of taxation and financial frictions.

I aim to complement the analysis by using the census of Chilean manufacturing firms (INEA). The database includes plant level data of both public and private firms.

Expected Results

Once I have showed that the model can generate firms' responses to changes in taxes, I will proceed to solve the optimal taxation problem. Following the Ramsey tradition, I will approach the optimal taxation problem by restricting the government to pick *linear* taxes in order to finance some exogenous expenditure level. The benevolent government will trade-off the distortions introduced by each of the tax instruments, in order to maximize the representative household's welfare.

References

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Auerbach, A. J. (1979). Share valuation and corporate equity policy. *Journal of Public Economics*, 11(3):291–305.

Bradford, D. F. (1981). The incidence and allocation effects of a tax on corporate distributions. *Journal of Public Economics*, 15(1):1–22.

Chetty, R. and Saez, E. (2005). Dividend taxes and corporate behavior: Evidence from the 2003 dividend tax cut. *The Quarterly Journal of Economics*, 120(3):791–833.

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Hennessy, C. A. and Whited, T. M. (2005). Debt dynamics. *The Journal of Finance*, 60(3):1129–1165.

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Zwick, E., Mahon, J., et al. (2014). Do financial frictions amplify fiscal policy? evidence from business investment stimulus. *Harvard University*.

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Harold L. Cole
Professor of Economics
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November 16, 2016

Selection Committee

To Whom It May Concern:

I am writing to recommend Daniel Wills for a position at your institution.. Daniel is just starting his sixth year as graduate student in the economics department. He has made excellent progress and is close to finishing his Ph.D.. Daniel is working at the intersection of Macroeconomics, Public Finance and Finance. This has been a very hot area of research and Daniel is well position to contribute to it. I am co-advising him with Dirk Krueger and Joao Gomes (at Wharton).

Daniel has three papers that are in various stages. The most advanced one is "Fighting for the Best, Losing with the Rest: On the Desirability of Competition in Financial Markets," which is joint with Juan Hernandez. This paper has already been presented at a several conferences. It examines the role of competition in a model of financial intermediaries and entrepreneurs. The intermediaries compete with each other by offering financial contracts to the entrepreneurs. The model features private information, from which we get adverse selection, and limited liability. They show that this combination of features can lead to competition inhibiting the ability of financial entrepreneurs to screen out entrepreneurs with bad projects. As a result the outcomes can be inefficient. They go on to show that this inefficiency can be corrected using a simple profits tax. This is a very neat paper and deserves to be published in a good journal.

Daniel's second project, "Taxing Firms with Financing Constraints", is joint with Gustavo Camilo. They are seeking to quantitatively characterize the optimal linear tax rates on various forms of capital income. This includes dividends, interest income, capital gains, and corporate profits. They undertake their analysis within the context of a model of heterogeneous firms that features entry and exit (as in Hugo Hopenhayn's classic paper). Firms are heterogeneous both with respect to their initial productivity draw And with respect to their accumulated net worth. An important element in their analysis is that firms face external financing constraints. As a result, it is optimal to delay taxation of financially constrained firms. This leads them to argue that dividend taxes are preferred to corporate profit taxes. The reason is that firms can optimally choose to delay taxation under dividend taxes by retaining earnings and using these earnings to finance their investments. They quantify the gains from switching away from corporate income taxes and find that they are large. These gains include substantial gains in overall productivity since this switch will affect the distribution of capital across firms with different productivity levels.

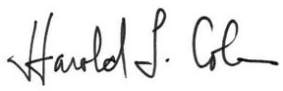
Daniel's third project, "Optimal Capital Taxes and Entrepreneurial Choice: New vs. Old Money," is joint with Ali Shourideh and Juan Hernandez. It examines optimal taxation within a Mirrleesian type environment in which individuals have private information about their productivity as workers or entrepreneurs. In addition their work or investment levels cannot be observed. As a result the tax system can only depend upon an individual's income and occupation. They characterize the optimal tax system in

this context. They plan on estimating the parameters of their model using Chilean plant level data. They then plan on both deriving the optimal tax system and on simulating the impact of the recent tax reform in their model. This is a ambitious project which seems very promising at this stage.

All of these projects are interesting and innovative. They show the range of Daniel's skill set since they require a combination of theory, estimation and computation. They also show his ability to come up with interesting and policy relevant research questions. The fact that that Daniel has collaborated with a range of coauthors also testifies to his strength as a researcher, and to his ability to help bring challenging projects to fruition.

I strongly recommend Daniel Wills to you. He is a very bright and clever researcher who is doing very interesting work. He also been a very successful and dedicate teaching assistant, which shows that he will do well in the classroom too. Please don't hesitate to contact me if there is any further information that I can provide.

Sincerely,



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Junior Recruiting Committee

November 4, 2016

To Whom It May Concern
Letter of Recommendation for Daniel Wills

Dear selection committee,

I am writing to warmly and enthusiastically recommend Daniel Wills for a position at your institution. Daniel is a quantitative macro economist whose main substantive research interests lie at the intersection of heterogeneous household macroeconomics, public finance and financial economics. I am co-advising him with Hal Cole, and Joao Gomes (Wharton) as well as Ali Shourideh (now Carnegie-Mellon, formerly Wharton) are the other two members of his dissertation committee, and provide expertise on the finance side of Daniel's work.

I discuss Daniel's work with him on a weekly basis and have him seen present his job market paper two times in the last two months. He has taken my first and second year macroeconomics courses and has been a member of the Penn Macro Club, our student lunchtime seminar for the past three years. Therefore it is fair to say that I know him, his research capabilities and presentation skills very well.

Daniel is currently in his sixth year of graduate studies here at Penn. To date he has completed two research papers and has embarked on a third project with Ali Shourideh.

In his job market paper *Taxing Firms Facing Financial Frictions* (joint with Gustavo Camilo) the authors construct a Hopenhayn-style industry dynamics model with entry and exit in which different production entities are subject to idiosyncratic productivity shocks and interact in general equilibrium. The representative households own the firms. Within the context of this model the authors then introduce, and study the optimal design, of different forms of capital income taxation, ranging from the taxation of corporate income as well as dividend, interest income and capital gains taxes.

In my view, this project is located in the literature roughly as follows: in standard frictionless neoclassical models of firm dynamics the mode of firm financing (equity financing, debt financing, retained earnings) is irrelevant since the Modigliani-Miller theorem applies. An increasingly quantitative literature has tried to break this irrelevance result by introducing firm financing constraints of various forms into the model, and has then used this class of models to

study the evolution of firm capital structure over time and in the cross-section of firms. In contrast, the quantitative public finance literature studying optimal capital income taxation is based mainly on the standard neoclassical model and thus cannot meaningfully distinguish between the different forms of capital income taxation. The current project therefore aims to study, quantitatively, optimal taxation of the different forms of capital income in a class of models where, due to financial constraints, the firm capital structure is not irrelevant and the different forms of capital income taxation have differential impact on the firm capital structure as well as investment dynamics.

The analysis proceeds in three logical steps. First a model with firm financing constraints is developed and calibrated. For the model to be useful for (optimal) policy analysis it is necessary that it captures the cross-sectional corporate finance facts well. In a second step, the allocative and normative consequences of a specific (potentially suboptimal) policy reform are analyzed in the context of the model. This is the 1999 corporate income tax reform. In a third and final step, the authors solve, the full Ramsey optimal tax problem, determining the best combination of corporate income taxes, dividend taxes, interest income as well capital gains taxes.[1]

I should also mention that Daniel has completed the very interesting optimal contracting paper *Fighting for the Best, Losing with the Rest: An Inefficient Outcome from Competitive Financial Contracts* with his follow classmate Juan Fernandez. This was his third year paper and I was not involved in advising it, but Hal Cole who will also furnish a letter on Daniel's behalf will testify to its high quality. Finally, Daniel has embarked on a promising project with Ali Shourideh from Wharton and Juan Hernandez on the optimal taxation of entrepreneurs (when these have the choice of becoming workers, depending on the tax system). These projects speak to his research productivity and to the very high demand here at Penn for Daniel as a co-author.

Overall, I view Daniel's project as ambitious, well thought out, feasible, catering to the strength of Daniel's research skills, highly topical and eminently policy relevant.

Daniel was a tremendously popular and effective Teaching Assistant (TA) for a number of courses. This is without doubt due to his dedication, hard work and his ability to communicate well with others that might, or might not share the same technical expertise in economics. I should also note that he has taught two courses here at Penn on his own. Therefore he has experience in designing and conducting his own courses; therefore he would come to your department as a well-prepared teacher ready to hit the classroom.

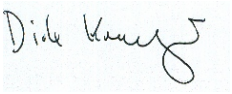
In our weekly student seminar Daniel has proven to be a strong intellectual leader, willing to help others and make their work better. His interjections are always lucid, yet articulated with a clear sense of purpose and focus on helping the speaker, rather than putting him or her down, which is not the norm in the ultra competitive environment of a top 10 PhD program. He is a true team player, both evident from the fact that he has co-authored two papers with others, and from the aforementioned contributions to our student workshop.

[1] In order to make this problem operational, as most of the literature the authors restrict attention to a simple, linear tax system characterized by a small number of tax policy parameters.

I am therefore highly confident that he will be a valued member of any research department he would join. I therefore recommend you consider Daniel Wills for your vacancy in the strongest possible terms.

Please do not hesitate to contact me if you have any questions about this letter.

Sincerely yours,



Dirk Krueger
Professor, Department of Economics
University of Pennsylvania
Editor, Journal of the European Economic Association

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Dear Colleague,

It is my pleasure to write this letter of recommendation for **Daniel Santiago Wills.** During my time at Wharton, I have got to know Daniel and become familiar with his work. He was also my RA during the summer of 2014.

Daniel is part of a recent crop of Penn students who are strongly tooled up in terms of their computational skills and have gone to be very successful over the years. Examples of these include Kurt Mitman at IIES, Fatih Karahan at the NYFed, Serdar Ozkan at Toronto, among many others. Overall, I think that his skillset is comparable to this group of people.

Daniel's main interest over these years has been macroeconomic policy and in particular, policies related to capital taxation. His job market paper is mainly focused on taxation of capital that is done at various levels, i.e., firms (debt, equity, corporate profits) as well as households. In addition, together with Juan Hernandez, another PhD student at Penn, and me, we are working on a paper where capital income taxes interact with labor income taxes through individuals' decisions to become entrepreneurs – as entrepreneurship seems to be a contributing factor behind income and wealth inequality. Both of these are interesting contributions to the literature on capital taxation. He also has some other work with Juan that I am less familiar with.

Let me start with Daniel's job market paper. In his job market paper, he develops a quantitative framework to analyze various types of tax policies that affect firms and their capital structure. These types of policies have not been greatly explored, especially in the macro literature. This is despite the recent interest in policy circles on tax inversions, corporate income taxes, etc. Therefore, his paper can be a nice contribution to a literature that has mainly stayed narrative or empirical. It is crucial to keep in mind that any analysis of corporate income tax reform has to take into account the capital structure of the firm. This is because of the deductibility of interest payments on debt and the fact that debt and equity are not perfect substitutes for investors. The most important contribution of his model, to me, is to consider these interactions in a quantitative general equilibrium model.

To achieve this, Daniel uses tools from finance to write down a model where firms use debt and equity to finance their investments and their payout policies are affected by taxes. Note that in this setting the much-celebrated production efficiency result of Diamond and Mirrlees does not apply. This is because firm's technologies are not constant returns to scale with respect to debt and equity. When production efficiency does not hold, designing the correct taxes for firms becomes an important question. To do this, Daniel builds on a state of the art model of firm's capital structure a la Hennessy and Whited (2007) where firms cannot issue debt as much as they like, i.e., they face collateral constraints. At the same time, issuing equity is costly, as many in the finance literature have shown – see the paper by Joao Gomes (2001) or Hennessy and Whited. He also allows for entry. In effect, the model is a Hopenhayn type model where firms enter small, finance investment by typically issuing debt – and sometimes equity – and slowly grow. This growth is stochastic as they get hit by productivity shocks and sometimes exit the market.

In this setup, corporate income tax policy has an effect that is quite intuitive. That is, since it takes time for firms to grow, corporate income taxes do not let the firm built enough retained earnings to be able to self-finance its investments. Note that this is the form of financing that is preferred by the firms since everything else is costly. This leads to two effects: first, entry will be low since the present value of profits is low; second, productive young firms stay small. The first effect leads to a lower aggregate stock of capital. The second effect leads to misallocation of capital across firms and thus lowers aggregate productivity.

The model is rich enough to be calibrated to the U.S. economy and match various moments of investment, capital structure and leverage, firms' life cycle, etc. The main exercise that he considers is to fully eliminate the corporate income tax and replace it with an increase in taxes on capital gains, i.e., dividends at the household level. His main result is that this leads to an increase in TFP of 1.7%, which mainly comes from improving the distribution of capital across firms. These improvements result in a 5% increase in wages, which in turn increases government's revenue from earnings taxes. Because of this expansion of the base, the resulting increase in capital gains taxes is around 20%; much lower than the decline in corporate income taxes; from 35% to 0.

As I have mentioned before, the key contribution in this paper is developing a nice and rather tractable framework. While tractable, solving the model still requires great computational prowess. This is a feat that he has managed to do. Additionally, due to its tractability, I think his framework allows him to do many more exercises and measure the effect of various reforms on capital structure and productivity. Thus the model can be used to think about various policy questions that are of interest to policy makers regarding corporate income tax.

Let me briefly mention his other paper, which is coauthored with me. Our main idea in this paper is to think about how taxes affect the decision to become an

entrepreneur and what this implies about evolution of inequality and pattern of optimal taxes. This is particularly important, since many authors have documented a decline in entry in various industries. This decline presumably can lead to bigger monopoly rents and contributes to a higher level of inequality. To perform this analysis, we develop a model where individuals are represented by two dimensions of heterogeneity: their labor and entrepreneurial productivity. They choose whether to become an entrepreneur or a worker. Interestingly optimal taxes depend on the joint distribution of the tax elasticity of income on each side – worker v.s. entrepreneur. In particular, it is possible to have non-zero taxes on the worker side even though the decision to work is fully inelastic. These taxes partially provide the right incentive for productive individuals to become entrepreneurs. The results are still preliminary but we are planning to embed this in a dynamic framework to analyze the distribution of wealth and income and the pattern of optimal non-linear taxes and optimal subsidies towards entrepreneurship. This is a novel exercise since optimal taxation of income in dynamic models of entrepreneurial choice still remains unexplored. I expect this to be an important paper and a solid contribution in Daniel's CV.

Overall, Daniel is very hard working and is always eager to learn the required tools to answer a question that comes to his mind. For example, he learned the capital structure literature mainly on his own and was able to adopt their model to answer his question. This quality is very important for a person like him who is typically trying to answer applied questions. Daniel is also well versed in English and is capable of teaching any course in macroeconomics or public finance. I, therefore, strongly recommend him to any economics department and business school outside of the top 5.

Please feel free to contact me with any questions or concerns.



Ali Shourideh
Assistant Professor of Economics
Carnegie Mellon University
Tepper School of Business